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## CLAIMS

[Claim(s)]

[Claim 1] A measurement means to be the hand off control system which performs hand off processing of this terminal, and to measure periodically the reinforcement of the input signal from said base station in said terminal in case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, A calculation means to compute the relative variation for every measuring time of the reinforcement of the input signal measured with this measurement means, A queue storing means by which the queue to which priority was given based on the relative variation of the input signal computed with this calculation means is stored, A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off is required, A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means, When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength A queue relocation means to rearrange periodically for every measuring time of said receiving signal strength, It supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel. The hand off control system characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel when it is vacant in this cel and there is a channel.

[Claim 2] In case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, it is the hand off control system which performs hand off processing of this terminal. Said terminal A measurement means to measure periodically the reinforcement of the input signal from said base station, and a calculation means to compute the relative variation for every measuring time of the reinforcement of the input signal measured with this measurement means, It has a transmitting means to transmit the measurement result in said measurement means, and the calculation result in said calculation means to said base station. Said base station While notifying the relative variation of the reinforcement of the input signal transmitted from said terminal, and the reinforcement of an input signal to the base station in the adjoining cel An interface means to notify this hand off demand to the base station in the adjoining cel when a hand off is required from said terminal, A queue storing means notified through this interface means by which the queue to which priority was given based on the relative variation of the reinforcement of an input signal is stored, A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off demand is notified through said interface means, A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the

reinforcement of the input signal measured with said measurement means, When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength A queue relocation means to rearrange periodically for every measuring time of said receiving signal strength, It supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel. The hand off control system characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel when it is vacant in this cel and there is a channel.

[Claim 3] In case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, it is the hand off control system which performs hand off processing of this terminal. Said terminal It has a measurement means to measure periodically the reinforcement of the input signal from said base station, and a transmitting means to transmit the measurement result in this measurement means to said base station. Said base station While notifying the reinforcement of the input signal transmitted from said terminal to the base station in the adjoining cel An interface means to notify this hand off demand to the base station in the adjoining cel when a hand off is required from said terminal, A calculation means notified through this interface means to compute the relative variation for every measuring time of the reinforcement of an input signal, A queue storing means by which the queue to which priority was given based on the calculation result in this calculation means is stored, A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off demand is notified through said interface means, A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means, When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength A queue relocation means to rearrange periodically for every measuring time of said receiving signal strength, It supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel. The hand off control system characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel when it is vacant in this cel and there is a channel.

[Claim 4] In a hand off control system according to claim 2 said base station It has the 1st storing means for storing the relative variation of the reinforcement of the input signal notified through said interface means. Said demand processing means The hand off control system characterized by distributing the call of this terminal to the corresponding queue based on the relative variation of the reinforcement of the input signal of the applicable terminal stored in said 1st storing means when a hand off demand is notified through said interface means.

[Claim 5] In a hand off control system given in claim 2 thru/or any 1 term of 4 said base station It has the 2nd storing means for storing the reinforcement of the input signal notified through said interface means. The aforementioned waiting ranking decision means The hand off control system characterized by determining the waiting ranking of the call of this terminal within the queue to which the call of this terminal was distributed based on the reinforcement of the input signal of the applicable terminal stored in said 2nd storing means.

[Claim 6] It is the hand off control system characterized by setting up said queue storing means highly in a hand off control system given in claim 1 thru/or any 1 term of 5 in forge-fire priority with the big relative variation of the reinforcement of said input signal.

[Claim 7] It is the hand off control system which said queue storing means is divided in a hand off control system given in claim 1 thru/or any 1 term of 6 for every level the relative variation of the reinforcement of said input signal was beforehand decided to be, and is characterized by the thing into which it was divided, and for which said queue is stored for every class.

[Claim 8] The aforementioned waiting ranking decision means is a hand off control system characterized by determining the waiting ranking of the call of said terminal that the call of said terminal is located in a line sequentially from what has the weak reinforcement of said input signal in a hand off control system given in claim 1 thru/or any 1 term of 7.

[Claim 9] The reinforcement of said input signal is a hand off control system characterized by becoming so weak that said terminal keeping away from said base station in a hand off control system given in claim 1 thru/or 8 any 1 terms.

[Claim 10] When said receiving signal strength of a certain hand off request call is updated, the aforementioned waiting ranking decision means [ whether this receiving signal strength is larger than the value adding the 1st hysteresis value (H1) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call concerned, and ] Or the hand off control system of nine given in any 1 term from claim 1 which updates waiting ranking of the call stored in said each queue only when smaller than the value which subtracted said 1st hysteresis value (H1) from the minimum threshold of the current waiting ranking of the hand off request call concerned.

[Claim 11] When said relative variation of a certain hand off request call is updated, said queue relocation means [ whether it is larger than the value to which this relative variation added the 2nd hysteresis value (H2) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call concerned is carried out, and ] Or only when the hand off request call concerned is smaller than the value which subtracted said 2nd hysteresis value (H2) from the minimum threshold of the class of the queue by which current arrangement is carried out The hand off control system of ten given in any 1 term from claim 1 which rearranges the call stored in said each queue.

[Claim 12] It is the hand off control approach performed in case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels. The reinforcement of the input signal from said base station in said terminal is measured periodically. When the relative variation for every measuring time of the reinforcement of the measured input signal was computed and a hand off is required. The call of the terminal which required the hand off is based on the relative variation of the reinforcement of the input signal in this terminal. It distributes to the queue which corresponds among the queues to which the priority by said relative variation was given beforehand. It is based on the reinforcement of the measured input signal. For every measuring time of the reinforcement of said input signal The waiting ranking of the call of said terminal is determined within the queue to which the call of said terminal was distributed. When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to said updated relative variation It supervises whether it rearranges periodically for every measuring time of said receiving signal strength, and is vacant in the cel of the migration place of said terminal, and there is any channel. The hand off control approach characterized by assigning the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel when it is vacant in this cel and there is a channel.

[Claim 13] The hand off control approach characterized by distributing the call of this terminal to a predetermined queue based on the relative variation of the reinforcement of the input signal of the stored applicable terminal when the relative variation of the reinforcement of the input signal of said base station in said terminal is stored beforehand and a hand off is required in the hand off control approach according to claim 12.

[Claim 14] The hand off control approach which stores the reinforcement of the input signal of said base station in said terminal beforehand, and is characterized by determining the waiting ranking of the call of this terminal within the queue to which the call of this terminal was distributed based on the reinforcement of the input signal of the stored applicable terminal in the hand off control approach according to claim 12 or 13.

[Claim 15] The hand off control approach characterized by the relative variation of the reinforcement of said input signal setting big forge-fire priority as claim 12 thru/or any 1 term of 14 highly in the hand off control approach of a publication.

[Claim 16] The hand off control approach which divides for every level which was able to decide the relative variation of the reinforcement of said input signal beforehand to be claim 12 thru/or any 1 term of 15 in the hand off control system of a publication, and is characterized by the thing into which it was divided, and for which said queue is created for every class.

[Claim 17] The hand off control approach characterized by determining the waiting ranking of the call of said terminal that the call of said terminal is located in a line with claim 12 thru/or any 1 term of 16 in the hand off control approach of a publication sequentially from what has the weak reinforcement of said input signal.

[Claim 18] When the terminal whose reinforcement of the input signal in time of day  $t_0$  was  $P_0$  moves the relative variation of the reinforcement of said input signal in the hand off control approach given in claim 12 thru/or any 1 term of 17 and the reinforcement of an input signal is set to  $P_1$  in time of day  $t_1$ , it is  $(P_1 - P_0) / (P_1 + P_0)$ .

The hand off control approach characterized by what is come out and defined.

[Claim 19] It is the hand off control approach characterized by what  $(P_1 - P_0) / P_1$  defines when the terminal whose reinforcement of the input signal in time of day  $t_0$  was  $P_0$  moves the relative variation of the reinforcement of said input signal in the hand off control approach given in claim 12 thru/or any 1 term of 17 and the reinforcement of an input signal is set to  $P_1$  in time of day  $t_1$ .

[Claim 20] It is the hand off control approach characterized by what  $(P_1 - P_0) / P_0$  defines when the terminal whose reinforcement of the input signal in time of day  $t_0$  was  $P_0$  moves the relative variation of the reinforcement of said input signal in the hand off control approach given in claim 12 thru/or any 1 term of 17 and the reinforcement of an input signal is set to  $P_1$  in time of day  $t_1$ .

[Claim 21] When the terminal whose reinforcement of the input signal in time of day  $t_0$  was  $P_0$  moves the relative variation of the reinforcement of said input signal in the hand off control approach given in claim 12 thru/or any 1 term of 17 and the reinforcement of an input signal is set to  $P_1$  in time of day  $t_1$ , it is  $(P_1 - P_0) / (t_1 - t_0)$ .

The hand off control approach characterized by what is come out and defined.

[Claim 22] In case said receiving signal strength of a certain hand off request call is updated and the waiting ranking within said each queue is determined [ whether this receiving signal strength is larger than the value adding the 1st hysteresis value ( $H_1$ ) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call concerned, and ] Or the hand off control approach of 21 given in any 1 term from claim 12 which updates waiting ranking of the call stored in said each queue only when smaller than the value which subtracted said 1st hysteresis value ( $H_1$ ) from the minimum threshold of the current waiting ranking of the hand off request call concerned.

[Claim 23] In case the call which said relative variation of a certain hand off request call is updated, and is stored in said each queue is rearranged [ whether it is larger than the value to which this relative variation added the 2nd hysteresis value ( $H_2$ ) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call concerned is carried out, and ] Or only when the hand off request call concerned is smaller than the value which subtracted said 2nd hysteresis value ( $H_2$ ) from the minimum threshold of the class of the queue by which current arrangement is carried out The hand off control approach of 22 given in any 1 term from claim 12 which rearranges the call stored in said each queue.

[Claim 24] The storage characterized by recording the program for performing the hand off control approach of a publication on claim 12 thru/or any 1 term of 23.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the hand off control system and the hand off control approach of giving priority and performing hand off processing especially, about the hand off control system in cellular communication system.

[0002]

[Description of the Prior Art] In recent years, the increment of the subscriber in migration communication system is being enhanced, and the increment in subscriber capacity is searched for.

[0003] Then, in order to make the subscriber capacity in migration communication system increase, it considers reducing a cel radius. When a cel radius is reduced, the number of the base stations in the field can increase, and, thereby, the number of channels which a subscriber uses can be increased.

[0004] Drawing 14 is drawing explaining the hand off control system in common migration communication system, and drawing in which drawing 14 (a) shows the case where a cel radius is set as arbitration, and drawing 14 (b) are drawings showing the case where a cel radius is reduced rather than what was shown in drawing 14 (a).

[0005] As shown in drawing 14 (a), in the condition that the terminal 110 existed in cel 130a of base station 120a, and has received service from base station 120a, the case where it moves in the direction of cel 130b of base station 120b is considered.

[0006] If the terminal 110 keeps away from base station 120a, the receiving signal strength from base station 120a in a terminal 110 becomes weak gradually. Here, receiving signal strength shows the magnitude of the power received from a base station.

[0007] If the receiving signal strength which the receiving signal strength from base station 120a is periodically measured in the terminal 110, and was measured becomes below the threshold decided beforehand, a hand off demand is sent out to base station 120a, and, thereby, a terminal 110 will be in the condition that service can be received also from base station 120b from a terminal 110. Here, in the hand off demand sent out from the terminal 110 to base station 120a, it is notified to base station 120b from base station 120a through the network (un-illustrating).

[0008] Then, at this time, a terminal 110 can receive service from both base stations 120a and 120b.

[0009] Then, when a terminal 110 keeps away from base station 120a further, the service from base station 120a is suspended, and a terminal 110 will be changed to base station 120b, and will receive only service.

[0010] In addition, the field where a terminal 110 can receive service from both base stations 120a and 120b is the area 140 which is the field at which cel 130a and cel 130b cross.

[0011] As shown in drawing 14 (b), when a cel radius is reduced, many hand off actuation mentioned above comes to be performed.

[0012] Therefore, when a cel radius is reduced, the traffic of a hand off increases and it becomes easy to generate communicative forced release.

[0013] In order to avoid this, the approach a hand off has a queue to the demand from a required

terminal For example D.Hong and S.S.Rappaport, "Traffic model and performance analysis for cellular mobile radio telephone systems with prioritized and non-prioritized handoff procedures", IEE proc.1, vol.136, no.5, and 1989., Q.A.Zeng and K.Mukumoto, A.Fukuda and "Performance analysis of mobile cellular It is indicated in radio system with priority reservation handoff procedures", IEEE Proc.VTC-94, vol.3, and 1994.

[0014] He always secures the channel only for hand offs partly among the set-up channels, and is trying not to use the channel to a new call in the former paper. Thereby, the incidence rate of the call loss at the time of a hand off is reduced.

[0015] Moreover, in the latter paper, the lost call rate of a new call is reduced by forming the buffer further for new calls in the technique indicated by the former paper, without seldom gathering the rate of cutting of a hand off call.

[0016] Moreover, in JP,7-264656,A, based on the formula in consideration of the rate and the migration direction of the terminal which moves, priority is given to hand off processing from a terminal, and the technique of performing hand off processing according to the priority is indicated.

[0017]

[Problem(s) to be Solved by the Invention] In the terminal which is moving between cells, the rate which moves is various, for example, the terminal which moves by the vehicle differs in passing speed mutually from the terminal which moves by on foot.

[0018] Since the time amount allowed after a hand off is required before ending processing of a hand off differed when passing speed differs, as mentioned above, when the hand off only performed hand off processing one by one to the demand from a required terminal and time amount after a hand off is required until it ends processing of a hand off becomes long in the terminal which moves to a high speed, a possibility that communicative forced release may occur is.

[0019] Moreover, in the terminal which moves to a high speed, in order to pass many cells to predetermined time amount, there is an inclination for the count of the hand off demanded between communication links to increase, and for communicative forced release to increase.

[0020] Moreover, in the terminal which is moving between cells, the path which moves is various, and there are some some which are left to the base station which has received current service, and there are some some which move so that a fixed distance may be maintained.

[0021] Since the time amount allowed after a hand off is required before ending processing of a hand off, when moving trucking differs, as mentioned above differs, In the terminal which separates to the base station which has received current service if a hand off only performs hand off processing one by one to the demand from a required terminal After a hand off is required, when processing of a hand off is overdue, processing does not meet the deadline but there is a possibility that communicative forced release may occur.

[0022] Moreover, in what was indicated by JP,7-264656,A, since the operation for giving priority becomes complicated and priority is given to each of a call, processing when a hand off is required is performed frequently, and there is a trouble that processing will become complicated.

[0023] This invention is made in view of the trouble which a Prior art which was mentioned above has, and aims at offering the hand off control system and the hand off control approach of reducing the incidence rate of communicative forced release by taking into consideration the time amount allowed after a terminal requires a hand off before processing of a hand off is completed.

[0024]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, in case the terminal which performs communication link actuation through the base station in a cell moves between two or more cells, this invention A measurement means to be the hand off control system which performs hand off processing of this terminal, and to measure periodically the reinforcement of the input signal from said base station in said terminal, A calculation means to compute the relative variation for every measuring time of the reinforcement of the input signal measured with this measurement means, A queue storing means by which the queue to which priority was given based on the relative variation of the input signal computed with this calculation means is stored, A demand processing means to



distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off is required, A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means, When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength A queue relocation means to rearrange periodically for every measuring time of said receiving signal strength, It supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel. When it is vacant in this cel and there is a channel, it is characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel.

[0025] In case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, it is the hand off control system which performs hand off processing of this terminal. Moreover, said terminal A measurement means to measure periodically the reinforcement of the input signal from said base station, and a calculation means to compute the relative variation for every measuring time of the reinforcement of the input signal measured with this measurement means, It has a transmitting means to transmit the measurement result in said measurement means, and the calculation result in said calculation means to said base station. Said base station While notifying the relative variation of the reinforcement of the input signal transmitted from said terminal, and the reinforcement of an input signal to the base station in the adjoining cel An interface means to notify this hand off demand to the base station in the adjoining cel when a hand off is required from said terminal, A queue storing means notified through this interface means by which the queue to which priority was given based on the relative variation of the reinforcement of an input signal is stored, A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off demand is notified through said interface means, A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means, When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength A queue relocation means to rearrange periodically for every measuring time of said receiving signal strength, It supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel. When it is vacant in this cel and there is a channel, it is characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel.

[0026] In case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, it is the hand off control system which performs hand off processing of this terminal. Moreover, said terminal It has a measurement means to measure periodically the reinforcement of the input signal from said base station, and a transmitting means to transmit the measurement result in this measurement means to said base station. Said base station While notifying the reinforcement of the input signal transmitted from said terminal to the base station in the adjoining cel An interface means to notify this hand off demand to the base station in the adjoining cel when a hand off is required from said terminal, A calculation means notified through this interface means to compute the relative variation for every measuring time of the reinforcement of an input signal, A queue storing means by which the queue to which priority was given based on the calculation result in this calculation means is stored, A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off demand is notified through said interface means, A waiting ranking decision means to determine the waiting ranking of the call of said terminal within

the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means. When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength. A queue relocation means to rearrange periodically for every measuring time of said receiving signal strength. It supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel. When it is vacant in this cel and there is a channel, it is characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel.

[0027] Moreover, said base station has the 1st storing means for storing the relative variation of the reinforcement of the input signal notified through said interface means, and it is characterized by to distribute said demand processing means to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal of the applicable terminal stored in said 1st storing means, when a hand off demand is notified through said interface means. Moreover, said base station has the 2nd storing means for storing the reinforcement of the input signal notified through said interface means, and the aforementioned waiting ranking decision means is characterized by determining the waiting ranking of the call of this terminal within the queue to which the call of this terminal was distributed based on the reinforcement of the input signal of the applicable terminal stored in said 2nd storing means.

[0028] Moreover, said queue storing means is characterized by setting up the relative variation of the reinforcement of said input signal highly in big force-fire priority.

[0029] Moreover, said queue storing means is divided for every level the relative variation of the reinforcement of said input signal was beforehand decided to be, and is characterized by the thing into which it was divided and for which said queue is stored for every class.

[0030] Moreover, the aforementioned waiting ranking decision means is characterized by determining the waiting ranking of the call of said terminal that the call of said terminal is located in a line sequentially from what has the weak reinforcement of said input signal.

[0031] Moreover, reinforcement of said input signal is characterized by becoming so weak that said terminal keeping away from said base station.

[0032] Moreover, when said receiving signal strength of a certain hand off request call is updated, the aforementioned waiting ranking decision means [ whether this receiving signal strength is larger than the value adding the 1st hysteresis value (H1) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call concerned, and ] Or only when smaller than the value which subtracted said 1st hysteresis value (H1) from the minimum threshold of the current waiting ranking of the hand off request call concerned, waiting ranking of the call stored in said each queue is updated.

[0033] Moreover, when said relative variation of a certain hand off request call is updated, said queue relocation means [ whether it is larger than the value to which this relative variation added the 2nd hysteresis value (H2) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call concerned is carried out, and ] Or only when the hand off request call concerned is smaller than the value which subtracted said 2nd hysteresis value (H2) from the minimum threshold of the class of the queue by which current arrangement is carried out, the call stored in said each queue is rearranged.

[0034] Moreover, it is the hand off control approach performed in case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels. The reinforcement of the input signal from said base station in said terminal is measured periodically. When the relative variation for every measuring time of the reinforcement of the measured input signal was computed and a hand off is required, The call of the terminal which required the hand off is based on the relative variation of the reinforcement of the input signal in this terminal. It distributes to the queue which corresponds among the queues to which the priority by said relative variation was given beforehand. It is based on the reinforcement of the measured input signal. For every measuring time of the reinforcement of said input signal The waiting ranking of the call of said terminal is determined



within the queue to which the call of said terminal was distributed. When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to said updated relative variation. It supervises whether it rearranges periodically for every measuring time of said receiving signal strength, and is vacant in the cell of the migration place of said terminal, and there is any channel. When it is vacant in this cell and there is a channel, it is characterized by assigning the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel.

[0035] Moreover, when the relative variation of the reinforcement of the input signal of said base station in said terminal is stored beforehand and a hand off is required, it is characterized by distributing the call of this terminal to a predetermined queue based on the relative variation of the reinforcement of the input signal of the stored applicable terminal.

[0036] Moreover, the reinforcement of the input signal of said base station in said terminal is stored beforehand, and it is characterized by determining the waiting ranking of the call of this terminal within the queue to which the call of this terminal was distributed based on the reinforcement of the input signal of the stored applicable terminal.

[0037] Moreover, relative variation of the reinforcement of said input signal is characterized by setting up big force-fire priority highly.

[0038] Moreover, it divides for every level which was able to determine the relative variation of the reinforcement of said input signal beforehand, and is characterized by the thing into which it was divided and for which said queue is created for every class.

[0039] Moreover, it is characterized by determining the waiting ranking of the call of said terminal that the call of said terminal is located in a line sequentially from what has the weak reinforcement of said input signal.

[0040] Moreover, the relative variation of the reinforcement of said input signal is  $(P1-P0)/(P1+P0)$ , when the terminal whose reinforcement of the input signal in time of day  $t0$  was  $P0$  moves and the reinforcement of an input signal is set to  $P1$  in time of day  $t1$ .

It is characterized by what is come out and defined.

[0041] Moreover, relative variation of the reinforcement of said input signal is characterized by what  $(P1-P0) / P1$  defines, when the terminal whose reinforcement of the input signal in time of day  $t0$  was  $P0$  moves and the reinforcement of an input signal is set to  $P1$  in time of day  $t1$ .

[0042] Moreover, relative variation of the reinforcement of said input signal is characterized by what  $(P1-P0) / P0$  defines, when the terminal whose reinforcement of the input signal in time of day  $t0$  was  $P0$  moves and the reinforcement of an input signal is set to  $P1$  in time of day  $t1$ .

[0043] Moreover, the relative variation of the reinforcement of said input signal is  $(P1-P0)/(t1-t0)$ , when the terminal whose reinforcement of the input signal in time of day  $t0$  was  $P0$  moves and the reinforcement of an input signal is set to  $P1$  in time of day  $t1$ .

It is characterized by what is come out and defined.

[0044] Moreover, it is a storage and is characterized by writing in said hand off control approach.

[0045] Moreover, in case said receiving signal strength of a certain hand off request call is updated and the waiting ranking within said each queue is determined [ whether this receiving signal strength is larger than the value adding the 1st hysteresis value ( $H1$ ) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call concerned, and ] Or only when smaller than the value which subtracted said 1st hysteresis value ( $H1$ ) from the minimum threshold of the current waiting ranking of the hand off request call concerned, waiting ranking of the call stored in said each queue is updated.

[0046] Moreover, in case the call which said relative variation of a certain hand off request call is updated, and is stored in said each queue is rearranged [ whether it is larger than the value to which this relative variation added the 2nd hysteresis value ( $H2$ ) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call concerned is carried out, and ] Or only when the hand off request call concerned is smaller than the value which subtracted said 2nd hysteresis value ( $H2$ ) from the minimum threshold of the class of the queue by which current

arrangement is carried out, the call stored in said each queue is rearranged.

[0047] In this invention constituted as mentioned above (Operation) In a measurement means, the reinforcement of the input signal from the base station in a terminal is measured periodically, and it sets for a calculation means. When the relative variation for every measuring time of the reinforcement of the input signal measured with the measurement means is computed and a hand off is required, it sets for a demand processing means. It is distributed to the queue to which the call of the terminal which required the hand off corresponds among the queues to which the priority by relative variation was given beforehand based on the relative variation of the reinforcement of the input signal in this terminal. Moreover, in a waiting ranking decision means, the waiting ranking of the call of a terminal is determined for every measuring time of the reinforcement of an input signal within the queue to which the call of a terminal was distributed based on the reinforcement of the input signal measured with the measurement means. Moreover, in a queue relocation means, when relative variation is updated, the call stored in each queue is periodically rearranged for every measuring time of receiving signal strength so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength. When it is supervised whether it is vacant in the cel of the migration place of a terminal, and there is any channel in a queue control means on the other hand, it is vacant in this cel and there is a channel, the call distributed in this queue in the sequence based on the priority of a queue and the waiting ranking within this queue is vacant, and it is assigned to a channel.

[0048] Thus, since hand off processing is performed in the sequence based on the relative variation of the reinforcement of the input signal in a terminal, and the reinforcement of an input signal The terminal with the short time amount allowed after requiring the hand off whose relative variation of the reinforcement of an input signal is a big terminal before hand off processing is completed It is processed ahead of a terminal with the long time amount allowed after requiring the hand off whose relative variation is a small terminal before hand off processing is completed, and the reinforcement of an input signal is weak, and hand off processing of a terminal with a possibility of becoming communication link cutting has priority, and it is carried out.

[0049] Moreover, in this invention, since the hysteresis characteristic was given to the judgment at the time of performing decision processing of the waiting ranking by the waiting ranking decision means, and relocation processing of the queue by the queue relocation means, control throughput is reducible by reducing the count of an update process.

[0050]

[Embodiment of the Invention] Below, the gestalt of operation of this invention is explained with reference to a drawing.

(1st operation gestalt) Drawing 1 is drawing showing the hand off control system of the 1st operation gestalt of this invention.

[0051] As shown in drawing 1, in this operation gestalt, the terminal 10 is moving in the direction of cel 30b of base station 20b in the condition of having existed in cel 30a of base station 20a, and having received service from base station 20a.

[0052] Here, in the terminal 10, the receiving signal strength from base station 20a is measured periodically, and the measured relative variation for every measuring time of receiving signal strength and receiving signal strength is notified to base station 20a.

[0053] Moreover, in the relative variation of receiving signal strength and receiving signal strength, it is notified also to base station 20b in cel 30b which adjoins cel 30of base station 20a a from base station 20a through the network (un-illustrating).

[0054] Moreover, while the relative variation of the receiving signal strength notified from the terminal 10 and receiving signal strength is stored in base stations 20a and 20b The queue to which priority was given based on the relative variation of receiving signal strength is created beforehand. When the demand of a hand off is sent out from a terminal 10, while being distributed to the queue to which a terminal 10 corresponds based on the relative variation of the receiving signal strength of a terminal 10, based on the receiving signal strength of a terminal 10, waiting ranking is determined in the queue to which the terminal 10 was distributed. Then, hand off control is performed based on priority.

[0055] Below, the calculation approach of the relative variation of receiving signal strength and the decision approach of priority in this gestalt are explained.

[0056] It is drawing explaining the case where drawing 2 is drawing for explaining the calculation approach of the receiving signal strength in the hand off control system shown in drawing 1, and drawing explaining the case where drawing 2 (a) moves from the location which has the receiving signal strength with two same terminals, and drawing 2 (b) move to the location where receiving signal strength becomes a hand off threshold from the location which has the receiving signal strength from which two terminals differ mutually. In addition, in drawing 2, time amount is shown in an axis of abscissa, and receiving signal strength is shown in the axis of ordinate, respectively.

[0057] In drawing 2 (a), the terminal whose receiving signal strength in time of day t0 was P0 moves, and suppose that receiving signal strength was set to PL1 in time of day t1. The relative variation in that case is defined by  $(PL1-P0)/(PL1+P0)$ .

[0058] Moreover, the terminal whose receiving signal strength in time of day t0 was P0 moves, and suppose that receiving signal strength was set to PH1 in time of day t1. The relative variation in that case is defined by  $(PH1-P0)/(PH1+P0)$ .

[0059] The absolute variation of the received electric-field signal strength of the terminal with which receiving signal strength was set to PL1 in time of day t1 serves as  $\Delta PL1$  here. The received electric-field signal strength of the terminal with which receiving signal strength was set to PH1 in time of day t1 absolutely moreover, variation It is set to absolutely bigger  $\Delta PH1$  of the received electric-field signal strength of the terminal with which receiving signal strength was set to PL1 in time of day t1 than  $\Delta PL1$  of variation. How depending on which the terminal with which receiving signal strength was set to PH1 in time of day t1 keeps away from a base station rather than the terminal with which receiving signal strength was set to PL1 in time of day t1 will be quick.

[0060] In addition, the terminal whose receiving signal strength in time of day t0 was P0 moves the relative variation mentioned above. When receiving signal strength is set to PL1 in time of day t1,  $(PL1-P0)/PL1$ , Or it can also define by  $(PL1-P0)/P0$ , and the terminal whose receiving signal strength in time of day t0 was P0 moves, and suppose that receiving signal strength was set to PH1 in time of day t1,  $(PH1-P0)/PH1$  or  $(PH1-P0)/P0$  can also define the relative variation in that case.

[0061] Moreover, in drawing 2 (b), the terminal whose receiving signal strength in time of day t0 was PL2 moves, and suppose that receiving signal strength became the hand off threshold P1 in time of day t1. The relative variation in that case is defined by  $(P1-PL2)/(t1-t0)$ .

[0062] Moreover, the terminal whose receiving signal strength in time of day t0 was PH2 moves, and suppose that receiving signal strength became the hand off threshold P1 in time of day t1. The relative variation in that case is defined by  $(P1-PH2)/(t1-t0)$ .

[0063] In time of day t0, the absolute variation of the received electric-field signal strength of the terminal whose receiving signal strength was PL2 serves as  $\Delta PL2$  here. In time of day t0, the received electric-field signal strength of the terminal whose receiving signal strength was PH2 absolutely moreover, variation In time of day t0 </SUB>, receiving signal strength serves as absolutely bigger  $\Delta PH2$  of the received electric-field signal strength of the terminal which was PL2 than  $\Delta PL2$  of variation. In time of day t0, how depending on which the terminal whose receiving signal strength was PH2 keeps away from a base station rather than the terminal whose receiving signal strength was PL2 in time of day t0 will be quick.

[0064] Drawing 3 is drawing for explaining the decision approach of the priority hand off processing of the terminal in the hand off control system shown in drawing 1.

[0065] As shown in drawing 3, the priority of the terminal in this gestalt is determined based on the magnitude of the relative variation of the receiving signal strength of the terminal. The relative variation of receiving signal strength is divided into four classes by the magnitude, and the priority of a terminal is determined by into which class the relative variation of the receiving signal strength of each terminal goes.

[0066] For example, terminal 10a goes into a class 2, terminal 10b goes into a class 3, and Terminal c goes into a class 4.

[0067] The class 4 of priority is the highest and the class 1 is the lowest.

[0068] Below, the detailed configuration of the terminal in this gestalt and a base station is explained.

[0069] Drawing 4 is the block diagram showing the example of 1 configuration of the terminal 10 in the hand off control system shown in drawing 1.

[0070] The antenna section 11 for the terminal 10 in this gestalt to perform reception and transmission of an electric wave, as shown in drawing 4, The transceiver amplifier 12 which carries out demultiplexing of a receiving RF signal and the transmitting RF signal while amplifying the transmitting RF signal transmitted through the receiving RF signal and the antenna section 11 which were received through the antenna section 11, While carrying out the quasi-synchronous detection of the receiving RF signal amplified by the transceiver amplifier 12 and changing into a digital signal The wireless section 13 which changes into an analog signal the sending signal transmitted through the antenna section 11, and is changed into a transmitting RF signal by quadrature modulation, Error-correcting-code-izing of the sending signal transmitted through the recovery of an input signal, the synchronization, the formation of an error correction double sign, and demultiplexing and the antenna section 11 of data changed into the digital signal in the wireless section 13, While performing baseband signaling processing of frame-izing, a data modulation, etc. The baseband signaling processing section 14 which possesses a measurement means to measure periodically the reinforcement of the input signal from base station 20a, and measures the reinforcement of this input signal, The relative variation calculation section 15 which is a calculation means to compute the relative variation for every measuring time of the reinforcement of the input signal measured in the baseband processing section 14, The terminal-interface section 16 which performs an interface with the hand set and external data terminal (un-illustrating) which have Voice CODEC and the adapter ability for data, and were connected outside, It has the radio control function which transmits and receives a control signal, and consists of control sections 17 which control actuation of the transceiver amplifier 12, the wireless section 13, the baseband signaling processing section 14, the relative variation calculation section 15, and the terminal-interface section 16.

[0071] In the terminal 10 constituted as mentioned above, when a signal is transmitted to base station 20a, first, baseband signaling processing is carried out in the baseband signaling processing section 14, and the signal inputted through the terminal-interface section 16 is changed into an analog signal in the wireless section 13 after that.

[0072] Next, in the transceiver amplifier 12, the signal changed into the analog signal in the wireless section 13 is amplified, and the amplified signal is transmitted to base station 20a through the antenna section 11.

[0073] On the other hand, when the signal transmitted from base station 20a is received, the signal received through the antenna section 11 is first amplified in the transceiver amplifier 12. In the wireless section 13, the quasi-synchronous detection of the amplified signal is carried out, and it is changed into a digital signal, and after that, in the baseband signaling processing section 14, baseband processing is carried out and the signal changed into the digital signal in the wireless section is outputted through the terminal-interface section 16.

[0074] Moreover, in the baseband signaling processing section 14, the reinforcement of the input signal from base station 20a is measured periodically, and the relative variation for every measuring time of the reinforcement of the input signal measured in the baseband processing section 14 is computed in the relative change calculation section 15.

[0075] The relative variation of the reinforcement of the input signal measured in the baseband signaling processing section 14 and the reinforcement of the input signal computed in the relative change calculation section 15 is notified to coincidence for every predetermined period at base station 20a.

[0076] Drawing 5 is the block diagram showing the example of 1 configuration of the base stations 20a and 20b in the hand off control system shown in drawing 1.

[0077] The antenna section 21 for the base stations 20a and 20b in this gestalt to perform reception and transmission of an electric wave, as shown in drawing 5, The transceiver amplifier 22 which carries out demultiplexing of a receiving RF signal and the transmitting RF signal while amplifying the transmitting

RF signal transmitted through the receiving RF signal and the antenna section 21 which were received through the antenna section 21. While carrying out the quasi-synchronous detection of the receiving RF signal amplified by the transceiver amplifier 22 and changing into a digital signal. The wireless section 23 which changes into an analog signal the signal transmitted through the antenna section 21, and is changed into a transmitting RF signal by the modulation, Error-correcting-code-izing of the sending signal transmitted through the recovery of an input signal, the synchronization, the formation of an error correction double sign, and demultiplexing and the antenna section 21 of data changed into the digital signal in the wireless section 23. The baseband signaling processing section 24 which performs baseband signaling processing of frame-izing, a data modulation, etc., The relative variation table 25 which is the 1st storing means for storing the relative variation of the receiving signal strength notified from the terminal 10 among the signals processed in the baseband processing section 24. The receiving signal strength table 33 which is the 2nd storing means for storing the receiving signal strength notified from the terminal 10 among the signals processed in the baseband processing section 24. The cable-transmission way interface section 26 which performs an interface with the high order equipment 50 connected outside. The queue section 31 in which the queue 31-1 to which priority was given based on the relative variation of receiving signal strength - 31-n were stored. The hand off demand processing section 28 which distributes the call of an applicable terminal to the queue 31-1 in the queue section 31 - 31-n based on the relative variation of the receiving signal strength of the applicable terminal stored in the relative variation table 25 when a hand off is required from a terminal. The switch 29 for changing processing of the queue 31-1 in the queue section 31 - 31-n based on the decision in the hand off demand processing section 28. The waiting ranking decision section 34 which determines the waiting ranking of the call in each of a queue 31-1 - 31-n based on the receiving signal strength of the applicable terminal stored in the receiving signal strength table 33. When the relative variation stored in the relative variation table 25 is updated. The hand off request call memorized by each queue 31-1 - 31-n so that it may be in the condition of being stored in the queue according to the relative variation of the receiving signal strength for every terminal in which it is stored by the relative variation table 25. While supervising [ the queue relocation section 35 rearranged periodically and ] whether it is vacant in a cell and there is any channel. When there is an empty channel, it supervises whether the call of a hand off demand exists in a queue 31-1 - 31-n. The queue control section 32 which is vacant based on the priority of a queue 31-1 - 31-n, and the waiting ranking of the call in each of a queue 31-1 - 31-n, and assigns the call of this hand off demand to a channel when there is a call of a hand off demand. While controlling actuation of the transceiver amplifier 22, the wireless section 23, the baseband signaling processing section 24, the cable-transmission way interface section 26, and the queue control section 32. A control signal with high order equipment 50 is transmitted and received, and it consists of control sections 27 which perform wireless line control, setting release of a wireless circuit, etc. In addition, the priority of the queue 31-1 in the queue section 31 - 31-n has the highest priority of a queue 31-1, and is the lowest. [ of the priority of queue 31-n ] Moreover, the waiting ranking of the call in each of a queue 31-1 - 31-n is controlled to stand in a line sequentially from what has the weak receiving signal strength in a terminal. Moreover, the receiving signal strength stored in the receiving signal strength table 33 is updated whenever receiving signal strength is notified from a terminal 10, and the waiting ranking decision section 34 determines the waiting ranking of the call in each of a queue 31-1 - 31-n whenever the receiving signal strength stored in the receiving signal strength table 33 is updated.

[0078] Below, the actuation in the hand off control system constituted as mentioned above is explained.

[0079] Drawing showing processing actuation [ in / in drawing 6 (a) / the hand off demand processing section 28 ], drawing showing processing actuation [ in / in drawing 6 (b) / the waiting ranking decision section 34 ], drawing showing processing actuation [ in / in drawing 7 / the queue relocation section 35 ], and drawing 8 are drawings showing the processing actuation in the queue control section 32.

[0080] First, the processing actuation in the hand off demand processing section 28 is explained with reference to drawing 6 (a).

[0081] In the terminal 10, the receiving signal strength from base station 20a is measured periodically, and the relative variation for every measuring time of the measured receiving signal strength and

receiving signal strength is notified to base station 20a.

[0082] The receiving signal strength which the receiving signal strength of the terminal 10 notified to base station 20a was stored in the receiving signal strength table 33 in base station 20a, and the relative variation of receiving signal strength was stored in the relative variation table 25 in base station 20a, respectively, and was stored in the receiving signal strength table 33 is updated whenever it is notified from a terminal 10.

[0083] Here, in the relative variation of the receiving signal strength of a terminal 10, and receiving signal strength, it is notified also to base station 20b from base station 20a through the cable-transmission way interface section 26 and a network, and the receiving signal strength of a terminal 10 is stored in the receiving signal strength table 33 in base station 20b, and the relative variation of the receiving signal strength of a terminal 10 is stored also in the relative variation table 25 in base station 20b, respectively.

[0084] Moreover, the relative variation of the receiving signal strength of a terminal is divided into two or more classes according to the value, the queue 31-1 by which priority was given to each - 31-n are created beforehand, and it is stored in the queue section 31. In addition, in a queue 31-1 - 31-n, a class with the biggest relative variation of receiving signal strength serves as a queue 31-1, priority becomes high most, a class with the smallest relative variation of receiving signal strength is set to queue 31-n, and priority becomes low most.

[0085] Here, if the terminal 10 keeps away from base station 20a, the receiving signal strength from base station 20a in a terminal 10 becomes weak gradually. In the terminal 10, the receiving signal strength from base station 20a is measured periodically, and if the measured receiving signal strength becomes below the hand off threshold decided beforehand, a hand off demand will be sent out from a terminal 10 to base station 20a. In addition, in the hand off demand sent out from the terminal 10 to base station 20a, it is notified to base station 20b from base station 20a through the cable-transmission way interface section 26 and a network.

[0086] When hand off processing is required from base station 20a from a terminal 10, the hand off demand is sent out to base station 20b (step S1), and the relative variation of the receiving signal strength of the terminal 10 which required hand off processing is first extracted from the relative variation table 25 in the hand off demand processing section 28 in base station 20b (step S2).

[0087] Next, in the hand off demand processing section 28, the call of the hand off demand by the terminal 10 is distributed to the queue of the class corresponding to the relative variation of the receiving signal strength extracted at step S2 among the queues within a queue 31 (step S3). Next, processing actuation of the waiting ranking decision section 34 is explained with reference to drawing 6 (b).

[0088] In the waiting ranking decision section 34, the receiving signal strength of the terminal 10 which required hand off processing is extracted from the receiving signal strength table 33 (step S4).

[0089] Then, based on the receiving signal strength extracted in step S4, the waiting ranking of the call of a terminal 10 is determined by control of the waiting ranking decision section 34 in the queue to which the call of the hand off demand by the terminal 10 was distributed (step S5). In addition, the waiting ranking of the call in each of a queue 31-1 - 31-n is updated whenever the receiving signal strength stored in the receiving signal strength table 33 is updated.

[0090] Moreover, in the queue relocation section 35, as shown in drawing 7, the relative variation of the hand off request call stored in each queue 31-1 - 31-n is periodically extracted from the relative variation table 25 (step S6). And the queue relocation section 35 will rearrange the hand off request call to other queues corresponding to the class, if the hand off request call memorized by a certain queue stops belonging to the class corresponding to the queue by updating relative variation (step S7). It is checked whether on the other hand, in the queue control section 32, first, it is vacant in cel 30b, and there is any channel (step S11).

[0091] When it is checked that it is vacant in step S11, and there is a channel, it is checked whether the call of a hand off demand exists in the queue 31-1 in the queue section 31 - 31-n (step S12).

[0092] When it is checked that the call of a hand off demand exists in the queue 31-1 in the queue section 31 - 31-n in step S12, the call of the hand off demand which exists in a queue 31-1 - 31-n is



assigned to the empty channel in cel 30b in the sequence based on priority and the waiting ranking in a queue 31-1 - 31-n (step S13).

[0093] It sets to the priority of a queue 31-1 - 31-n here. The priority of a queue 31-1 is the highest. Since the priority of queue 31-n is the lowest, The call of the hand off demand within a queue 31-1 is processed most previously, and is sequentially processed after that like the call of the hand off demand in the call of the hand off demand within a queue 31-2, the call of the hand off demand within a queue 31-3, ..., queue 31-n. Moreover, when two or more calls exist in the same queue, it is processed in the sequence based on the waiting ranking determined in the waiting ranking decision section 34. Moreover, when two or more calls which have the waiting ranking same in the same queue exist, it is processed in the sequence distributed to the queue.

[0094] Moreover, processing of the call which remains in the queue control section 32 in the condition that the relative variation of receiving signal strength and receiving signal strength will not be notified from a terminal 10 when the call of the hand off demand by this terminal 10 remains in a queue 31-1 - 31-n is not performed, but it is discarded from a queue and hand off processing of a call in which the following waiting ranking was given is performed.

[0095] Moreover, when a terminal 10 is not able to perform a hand off in hand off area, in the queue control section 32, processing of the call of the hand off demand by this terminal 10 is not performed, but hand off processing of a call in which the following waiting ranking was given is performed.

[0096] In addition, the usual processing is performed when a new call occurs.

[0097] Moreover, although the relative variation of the receiving signal strength in a terminal 10 was computed in the relative variation calculation section 15 within a terminal 10 and was notified to base stations 20a and 20b with the receiving signal strength in a terminal 10 in this operation gestalt In the exchange which becomes high order equipment 50 of base stations 20a and 20b or base stations 20a and 20b From the receiving signal strength notified from the terminal 10, a means to compute the relative variation for every measuring time of the receiving signal strength in a terminal 10 is established. From a terminal 10, only receiving signal strength is notified to base stations 20a and 20b, and computing the relative variation for every measuring time of the receiving signal strength in a terminal 10 at a base station or the exchange is also considered.

[0098] Although this operation gestalt explained that hand off processing was performed in the sequence based on the passing speed of a terminal, since priority is determined based on the relative variation of the receiving signal strength of the terminal, in this invention, hand off processing is able to be performed in consideration of the moving trucking of a terminal in the sequence based on the speed of how to keep away from a base station.

[0099] Drawing 9 is drawing for explaining control by the moving trucking of a terminal in the hand off control system of this operation gestalt.

[0100] as shown in drawing 9, terminal 10a shall move the cel 30 of a base station 20 linearly, and terminal 10b shall move between predetermined and in the inside of a cel 20 so that distance with a base station 20 may serve as about 1 law In addition, let mutually passing speed of terminal 10a and terminal 10b be an equal.

[0101] Then, although the receiving signal strength of terminal 10a changes, the receiving signal strength of terminal 10b becomes almost fixed between predetermined.

[0102] Therefore, when hand off processing is required in Terminals 10a and 10b, rather than the call of a hand off demand according [ the direction of the call of the hand off demand by terminal 10a with the big relative variation of receiving signal strength ] to terminal 10b, priority becomes high and comes to be processed previously.

[0103] (2nd operation gestalt) Next, the hand off control system of the 2nd operation gestalt of this invention is explained. With the operation gestalt of the above 1st, if the relative variation of the receiving signal strength stored in the relative variation table 25 is updated, the queue relocation section 35 will rearrange the hand off request call in a queue 31-1 - 31-n to the queue corresponding to the updated relative variation. And if the receiving signal strength stored in the receiving signal strength table 33 is updated, renewal of the waiting ranking in a queue 31-1 - 31-n will be performed by the

waiting ranking decision section 34.

[0104] However, when relative variation is changed in the threshold level neighborhood which performs a class division of a queue, relocation by the queue relocation section 35 will be performed frequently, and the processing burden in a control section 27 becomes large.

[0105] For example, as relative variation shows drawing 10, when it changes, in time of day t1, t2, t3, t4, and t5, relocation by the queue relocation section 35 is performed.

[0106] Moreover, when receiving signal strength is changed similarly in the neighborhood of the threshold level to which renewal of the waiting ranking within a queue is performed, an update process of the waiting ranking by the waiting ranking decision section 34 will be performed complicated, and the processing burden in a control section 27 becomes large.

[0107] The hand off control system of this operation gestalt is for reducing the processing burdens in the case of being above, and the processing actuation at the time of updating in the waiting ranking decision section 34 and the queue relocation section 35 differs as compared with the operation gestalt of the above 1st. And the other processing actuation, a configuration, etc. are the same as that of the operation gestalt of the above 1st.

[0108] Next, the actuation in the hand off control system of this operation gestalt is explained with reference to drawing 11 and drawing 12.

[0109] The flow chart and drawing 12 which show processing actuation of the waiting ranking decision section [ in / in drawing 11 / the hand off control system of this operation gestalt ] 34 are a flow chart which shows processing actuation of the queue relocation section 35 in the hand off control system of this operation gestalt.

[0110] First, processing actuation of the waiting ranking decision section 34 is explained using drawing 11.

[0111] In the waiting ranking decision section 34, the receiving signal strength of the terminal 10 which required hand off processing is extracted from the receiving signal strength table 33 (step S21).

[0112] And the receiving signal strength extracted from the receiving signal strength table 33 the waiting ranking decision section 34 [ whether it is larger than the value adding the hysteresis value (H1) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call, and ] Or it judges whether it is smaller than the value which subtracted the hysteresis value (H1) defined beforehand from the minimum threshold of the current waiting ranking of the hand off request call (step S22).

[0113] And only when it corresponds to criteria in processing of S22, in the waiting ranking decision section 34, the waiting ranking of the call of a terminal 10 is determined based on the receiving signal strength extracted at step S21 in the queue to which the call of the hand off demand by the terminal 10 was distributed (step S23).

[0114] Here, the upper limit threshold in processing of step S30 is a value of the receiving signal strength of the hand off request call with which waiting ranking is the value of the receiving signal strength of the hand off request call set up previously [ one ], and waiting ranking is set up after one rather than the hand off request call with which the minimum threshold is processing from the hand off request call which is processing.

[0115] Next, processing actuation of the queue relocation section 35 is explained using drawing 12.

[0116] In the queue relocation section 35, the relative variation of the hand off request call stored in each queue 31-1 ~ 31-n is periodically extracted from the relative variation table 25 (step S6).

[0117] And the relative variation extracted from the relative variation table 25 the queue relocation section 35 [ whether it is larger than the value adding the hysteresis value (H2) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call is carried out, and ] Or it judges whether it is smaller than the value which subtracted the hysteresis value (H2) defined beforehand from the minimum threshold of the class of the queue by which current arrangement of the hand off request call is carried out (step S30).

[0118] And only when it corresponds to criteria in processing of step S30, the queue relocation section 35 will rearrange the hand off request call to other queues corresponding to the class, if the hand off

request call memorized by a certain queue stops belonging to the class corresponding to the queue by updating relative variation (step S7).

[0119] Here, when the hand off request call corresponds to the class 2 in drawing 3, the upper limit threshold in processing of step S22 is the level of the boundary of a class 2 and a class 3, and a minimum threshold is the level of the boundary of a class 1 and a class 2.

[0120] For example, as relative variation shows drawing 13, when it changes, in time of day t6, relocation by the queue relocation section 35 is performed only once. This shows that the count of an update process is becoming fewer as compared with the count of the relocation in drawing 10 having been performed 5 times.

[0121] With this operation gestalt, a hysteresis characteristic can be given to the judgment at the time of performing decision processing of the waiting ranking by the waiting ranking decision section 34, and relocation processing of the queue by the queue relocation section 35, and control throughput can be reduced by reducing the count of an update process.

[0122] Although the case where a hysteresis characteristic was given to both judgments at the time of performing decision processing of the waiting ranking by the waiting ranking decision section 34 and relocation processing of the queue by the queue relocation section 35 was explained, this invention is not limited to this and you may make it give a hysteresis characteristic to the judgment in one of processings with this operation gestalt furthermore.

[0123] Moreover, although not shown in drawing, the hand off control system of the above 1st and the 2nd operation gestalt is equipped with the record medium which recorded the program for performing the hand off control approach. This record medium may be a record medium of CD-ROM, a floppy disk, a magneto-optic disk, semiconductor memory, or others.

[0124] This program is read into the base station and terminal of a hand off control system from a record medium, and controls actuation of a base station and a terminal. And this base station and terminal perform the above-mentioned processing by this program control.

[0125]

[Effect of the Invention] As explained above, this invention is written as the configuration which performs hand off processing in the sequence based on the relative variation of the reinforcement of the input signal in a terminal, and the reinforcement of an input signal. The time amount allowed after requiring the hand off whose relative variation of the reinforcement of an input signal is a big terminal before hand off processing is completed a short terminal. It can process ahead of a terminal with the long time amount allowed after requiring the hand off whose relative variation is a small terminal before hand off processing is completed, and the reinforcement of an input signal is weak, and priority can be given to hand off processing of a terminal with a possibility of becoming communication link cutting, and it can carry out.

[0126] The terminal with quick passing speed has the time amount shorter than a terminal with slow passing speed allowed after requiring a hand off before hand off processing is completed here.

Moreover, the terminal which moves in the path which separates to the base station which has received current service. Since the time amount allowed after requiring a hand off rather than the terminal which moves so that a fixed distance may be maintained before hand off processing is completed is short, The incidence rate of the forced release of the communication link in a terminal with quick passing speed and the terminal which moves in the path which separates to the base station which has received the present service can be reduced.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the hand off control system and the hand off control approach of giving priority and performing hand off processing especially, about the hand off control system in cellular communication system.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] In recent years, the increment of the subscriber in migration communication system is being enhanced, and the increment in subscriber capacity is searched for. [0003] Then, in order to make the subscriber capacity in migration communication system increase, it considers reducing a cel radius. When a cel radius is reduced, the number of the base stations in the field can increase, and, thereby, the number of channels which a subscriber uses can be increased.

[0004] Drawing 14 is drawing explaining the hand off control system in common migration communication system, and drawing in which drawing 14 (a) shows the case where a cel radius is set as arbitration, and drawing 14 (b) are drawings showing the case where a cel radius is reduced rather than what was shown in drawing 14 (a).

[0005] As shown in drawing 14 (a), in the condition that the terminal 110 existed in cel 130a of base station 120a, and has received service from base station 120a, the case where it moves in the direction of cel 130b of base station 120b is considered.

[0006] If the terminal 110 keeps away from base station 120a, the receiving signal strength from base station 120a in a terminal 110 becomes weak gradually. Here, receiving signal strength shows the magnitude of the power received from a base station.

[0007] If the receiving signal strength which the receiving signal strength from base station 120a is periodically measured in the terminal 110, and was measured becomes below the threshold decided beforehand, a hand off demand is sent out to base station 120a, and, thereby, a terminal 110 will be in the condition that service can be received also from base station 120b from a terminal 110. Here, in the hand off demand sent out from the terminal 110 to base station 120a, it is notified to base station 120b from base station 120a through the network (un-illustrating).

[0008] Then, at this time, a terminal 110 can receive service from both base stations 120a and 120b.

[0009] Then, when a terminal 110 keeps away from base station 120a further, the service from base station 120a is suspended, and a terminal 110 will be changed to base station 120b, and will receive only service.

[0010] In addition, the field where a terminal 110 can receive service from both base stations 120a and 120b is the area 140 which is the field at which cel 130a and cel 130b cross.

[0011] As shown in drawing 14 (b), when a cel radius is reduced, many hand off actuation mentioned above comes to be performed.

[0012] Therefore, when a cel radius is reduced, the traffic of a hand off increases and it becomes easy to generate communicative forced release.

[0013] In order to avoid this, the approach a hand off has a queue to the demand from a required terminal. For example D.Hong and S.S.Rappaport, "Traffic model and performance analysis for cellular mobile radio telephone systems with prioritized and non-prioritized handoff procedures", IEE proc.I, vol.136, no.5, and 1989., Q.A.Zeng and K.Mukumoto, A.Fukuda and "Performance analysis of mobile cellular it is indicated in radio system with priority reservation handoff procedures", IEEE Proc.VTC-94, vol.3, and 1994.

[0014] He always secures the channel only for hand offs partly among the set-up channels, and is trying

not to use the channel to a new call in the former paper. Thereby, the incidence rate of the call loss at the time of a hand off is reduced.

[0015] Moreover, in the latter paper, the lost call rate of a new call is reduced by forming the buffer further for new calls in the technique indicated by the former paper, without seldom gathering the rate of cutting of a hand off call.

[0016] Moreover, in JP,7-264656,A, based on the formula in consideration of the rate and the migration direction of the terminal which moves, priority is given to hand off processing from a terminal, and the technique of performing hand off processing according to the priority is indicated.

[Translation done.]



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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, this invention is written as the configuration which performs hand off processing in the sequence based on the relative variation of the reinforcement of the input signal in a terminal, and the reinforcement of an input signal. The time amount allowed after requiring the hand off whose relative variation of the reinforcement of an input signal is a big terminal before hand off processing is completed a short terminal It can process ahead of a terminal with the long time amount allowed after requiring the hand off whose relative variation is a small terminal before hand off processing is completed, and the reinforcement of an input signal is weak, and priority can be given to hand off processing of a terminal with a possibility of becoming communication link cutting, and it can carry out.

[0126] The terminal with quick passing speed has the time amount shorter than a terminal with slow passing speed allowed after requiring a hand off before hand off processing is completed here. Moreover, the terminal which moves in the path which separates to the base station which has received current service Since the time amount allowed after requiring a hand off rather than the terminal which moves so that a fixed distance may be maintained before hand off processing is completed is short, The incidence rate of the forced release of the communication link in a terminal with quick passing speed and the terminal which moves in the path which separates to the base station which has received the present service can be reduced.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In the terminal which is moving between cells, the rate which moves is various, for example, the terminal which moves by the vehicle differs in passing speed mutually from the terminal which moves by on foot.

[0018] Since the time amount allowed after a hand off is required before ending processing of a hand off differed when passing speed differs, as mentioned above, when the hand off only performed hand off processing one by one to the demand from a required terminal and time amount after a hand off is required until it ends processing of a hand off becomes long in the terminal which moves to a high speed, a possibility that communicative forced release may occur is.

[0019] Moreover, in the terminal which moves to a high speed, in order to pass many cells to predetermined time amount, there is an inclination for the count of the hand off demanded between communication links to increase, and for communicative forced release to increase.

[0020] Moreover, in the terminal which is moving between cells, the path which moves is various, and there are some some which are left to the base station which has received current service, and there are some some which move so that a fixed distance may be maintained.

[0021] Since the time amount allowed after a hand off is required before ending processing of a hand off, when moving trucking differs, as mentioned above differs, In the terminal which separates to the base station which has received current service if a hand off only performs hand off processing one by one to the demand from a required terminal After a hand off is required, when processing of a hand off is overdue, processing does not meet the deadline but there is a possibility that communicative forced release may occur.

[0022] Moreover, in what was indicated by JP,7-264656,A, since the operation for giving priority becomes complicated and priority is given to each of a call, processing when a hand off is required is performed frequently, and there is a trouble that processing will become complicated.

[0023] This invention is made in view of the trouble which a Prior art which was mentioned above has, and aims at offering the hand off control system and the hand off control approach of reducing the incidence rate of communicative forced release by taking into consideration the time amount allowed after a terminal requires a hand off before processing of a hand off is completed.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, in case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, this invention A measurement means to be the hand off control system which performs hand off processing of this terminal, and to measure periodically the reinforcement of the input signal from said base station in said terminal, A calculation means to compute the relative variation for every measuring time of the reinforcement of the input signal measured with this measurement means, A queue storing means by which the queue to which priority was given based on the relative variation of the input signal computed with this calculation means is stored, A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off is required, A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means, When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength A queue relocation means to rearrange periodically for every measuring time of said receiving signal strength, It supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel. When it is vacant in this cel and there is a channel, it is characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel.

[0025] In case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, it is the hand off control system which performs hand off processing of this terminal. Moreover, said terminal A measurement means to measure periodically the reinforcement of the input signal from said base station, and a calculation means to compute the relative variation for every measuring time of the reinforcement of the input signal measured with this measurement means, It has a transmitting means to transmit the measurement result in said measurement means, and the calculation result in said calculation means to said base station. Said base station While notifying the relative variation of the reinforcement of the input signal transmitted from said terminal, and the reinforcement of an input signal to the base station in the adjoining cel An interface means to notify this hand off demand to the base station in the adjoining cel when a hand off is required from said terminal, A queue storing means notified through this interface means by which the queue to which priority was given based on the relative variation of the reinforcement of an input signal is stored, A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off demand is notified through said interface means, A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means, When said relative variation

is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength A queue relocation means to rearrange periodically for every measuring time of said receiving signal strength. It supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel. When it is vacant in this cel and there is a channel, it is characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel.

[0026] In case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, it is the hand off control system which performs hand off processing of this terminal. Moreover, said terminal It has a measurement means to measure periodically the reinforcement of the input signal from said base station, and a transmitting means to transmit the measurement result in this measurement means to said base station. Said base station While notifying the reinforcement of the input signal transmitted from said terminal to the base station in the adjoining cel An interface means to notify this hand off demand to the base station in the adjoining cel when a hand off is required from said terminal. A calculation means notified through this interface means to compute the relative variation for every measuring time of the reinforcement of an input signal. A queue storing means by which the queue to which priority was given based on the calculation result in this calculation means is stored. A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off demand is notified through said interface means. A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means. When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength A queue relocation means to rearrange periodically for every measuring time of said receiving signal strength. It supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel. When it is vacant in this cel and there is a channel, it is characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel.

[0027] Moreover, said base station has the 1st storing means for storing the relative variation of the reinforcement of the input signal notified through said interface means, and it is characterized by to distribute said demand processing means to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal of the applicable terminal stored in said 1st storing means, when a hand off demand is notified through said interface means. Moreover, said base station has the 2nd storing means for storing the reinforcement of the input signal notified through said interface means, and the aforementioned waiting ranking decision means is characterized by determining the waiting ranking of the call of this terminal within the queue to which the call of this terminal was distributed based on the reinforcement of the input signal of the applicable terminal stored in said 2nd storing means.

[0028] Moreover, said queue storing means is characterized by setting up the relative variation of the reinforcement of said input signal highly in big forge-fire priority.

[0029] Moreover, said queue storing means is divided for every level the relative variation of the reinforcement of said input signal was beforehand decided to be, and is characterized by the thing into which it was divided and for which said queue is stored for every class.

[0030] Moreover, the aforementioned waiting ranking decision means is characterized by determining the waiting ranking of the call of said terminal that the call of said terminal is located in a line sequentially from what has the weak reinforcement of said input signal.

[0031] Moreover, reinforcement of said input signal is characterized by becoming so weak that said terminal keeping away from said base station.

[0032] Moreover, when said receiving signal strength of a certain hand off request call is updated, the

aforementioned waiting ranking decision means [ whether this receiving signal strength is larger than the value adding the 1st hysteresis value (H1) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call concerned, and ] Or only when smaller than the value which subtracted said 1st hysteresis value (H1) from the minimum threshold of the current waiting ranking of the hand off request call concerned, waiting ranking of the call stored in said each queue is updated.

[0033] Moreover, when said relative variation of a certain hand off request call is updated, said queue relocation means [ whether it is larger than the value to which this relative variation added the 2nd hysteresis value (H2) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call concerned is carried out, and ] Or only when the hand off request call concerned is smaller than the value which subtracted said 2nd hysteresis value (H2) from the minimum threshold of the class of the queue by which current arrangement is carried out, the call stored in said each queue is rearranged.

[0034] Moreover, it is the hand off control approach performed in case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels. The reinforcement of the input signal from said base station in said terminal is measured periodically. When the relative variation for every measuring time of the reinforcement of the measured input signal was computed and a hand off is required, The call of the terminal which required the hand off is based on the relative variation of the reinforcement of the input signal in this terminal. It distributes to the queue which corresponds among the queues to which the priority by said relative variation was given beforehand. It is based on the reinforcement of the measured input signal. For every measuring time of the reinforcement of said input signal The waiting ranking of the call of said terminal is determined within the queue to which the call of said terminal was distributed. When said relative variation is updated, the call stored in said each queue so that it may be in the condition of being stored in the queue according to said updated relative variation It supervises whether it rearranges periodically for every measuring time of said receiving signal strength, and is vacant in the cel of the migration place of said terminal, and there is any channel. When it is vacant in this cel and there is a channel, it is characterized by assigning the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel.

[0035] Moreover, when the relative variation of the reinforcement of the input signal of said base station in said terminal is stored beforehand and a hand off is required, it is characterized by distributing the call of this terminal to a predetermined queue based on the relative variation of the reinforcement of the input signal of the stored applicable terminal.

[0036] Moreover, the reinforcement of the input signal of said base station in said terminal is stored beforehand, and it is characterized by determining the waiting ranking of the call of this terminal within the queue to which the call of this terminal was distributed based on the reinforcement of the input signal of the stored applicable terminal.

[0037] Moreover, relative variation of the reinforcement of said input signal is characterized by setting up big forge-fire priority highly.

[0038] Moreover, it divides for every level which was able to determine the relative variation of the reinforcement of said input signal beforehand, and is characterized by the thing into which it was divided and for which said queue is created for every class.

[0039] Moreover, it is characterized by determining the waiting ranking of the call of said terminal that the call of said terminal is located in a line sequentially from what has the weak reinforcement of said input signal.

[0040] Moreover, the relative variation of the reinforcement of said input signal is  $(P1-P0)/(P1+P0)$ , when the terminal whose reinforcement of the input signal in time of day t0 was P0 moves and the reinforcement of an input signal is set to P1 in time of day t1.

It is characterized by what is come out and defined.

[0041] Moreover, relative variation of the reinforcement of said input signal is characterized by what  $(P1-P0) / P1$  defines, when the terminal whose reinforcement of the input signal in time of day t0 was P0 moves and the reinforcement of an input signal is set to P1 in time of day t1.

[0042] Moreover, relative variation of the reinforcement of said input signal is characterized by what  $(P1-P0) / P0$  defines, when the terminal whose reinforcement of the input signal in time of day  $t0$  was  $P0$  moves and the reinforcement of an input signal is set to  $P1$  in time of day  $t1$ .

[0043] Moreover, the relative variation of the reinforcement of said input signal is  $(P1-P0)/(t1-t0)$ , when the terminal whose reinforcement of the input signal in time of day  $t0$  was  $P0$  moves and the reinforcement of an input signal is set to  $P1$  in time of day  $t1$ .

It is characterized by what is come out and defined.

[0044] Moreover, it is a storage and is characterized by writing in said hand off control approach.

[0045] Moreover, in case said receiving signal strength of a certain hand off request call is updated and the waiting ranking within said each queue is determined [ whether this receiving signal strength is larger than the value adding the 1st hysteresis value ( $H1$ ) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call concerned, and ] Or only when smaller than the value which subtracted said 1st hysteresis value ( $H1$ ) from the minimum threshold of the current waiting ranking of the hand off request call concerned, waiting ranking of the call stored in said each queue is updated.

[0046] Moreover, in case the call which said relative variation of a certain hand off request call is updated, and is stored in said each queue is rearranged [ whether it is larger than the value to which this relative variation added the 2nd hysteresis value ( $H2$ ) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call concerned is carried out, and ] Or only when the hand off request call concerned is smaller than the value which subtracted said 2nd hysteresis value ( $H2$ ) from the minimum threshold of the class of the queue by which current arrangement is carried out, the call stored in said each queue is rearranged.

[Translation done.]



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## OPERATION

In this invention constituted as mentioned above (Operation) In a measurement means, the reinforcement of the input signal from the base station in a terminal is measured periodically, and it sets for a calculation means. When the relative variation for every measuring time of the reinforcement of the input signal measured with the measurement means is computed and a hand off is required, it sets for a demand processing means. It is distributed to the queue to which the call of the terminal which required the hand off corresponds among the queues to which the priority by relative variation was given beforehand based on the relative variation of the reinforcement of the input signal in this terminal. Moreover, in a waiting ranking decision means, the waiting ranking of the call of a terminal is determined for every measuring time of the reinforcement of an input signal within the queue to which the call of a terminal was distributed based on the reinforcement of the input signal measured with the measurement means. Moreover, in a queue relocation means, when relative variation is updated, the call stored in each queue is periodically rearranged for every measuring time of receiving signal strength so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength. When it is supervised whether it is vacant in the cel of the migration place of a terminal, and there is any channel in a queue control means on the other hand, it is vacant in this cel and there is a channel, the call distributed in this queue in the sequence based on the priority of a queue and the waiting ranking within this queue is vacant, and it is assigned to a channel.

[0048] Thus, since hand off processing is performed in the sequence based on the relative variation of the reinforcement of the input signal in a terminal, and the reinforcement of an input signal The terminal with the short time amount allowed after requiring the hand off whose relative variation of the reinforcement of an input signal is a big terminal before hand off processing is completed It is processed ahead of a terminal with the long time amount allowed after requiring the hand off whose relative variation is a small terminal before hand off processing is completed, and the reinforcement of an input signal is weak, and hand off processing of a terminal with a possibility of becoming communication link cutting has priority, and it is carried out.

[0049] Moreover, in this invention, since the hysteresis characteristic was given to the judgment at the time of performing decision processing of the waiting ranking by the waiting ranking decision means, and relocation processing of the queue by the queue relocation means, control throughput is reducible by reducing the count of an update process.

[0050]

[Embodiment of the Invention] Below, the gestalt of operation of this invention is explained with reference to a drawing.

(1st operation gestalt) Drawing 1 is drawing showing the hand off control system of the 1st operation gestalt of this invention.

[0051] As shown in drawing 1, in this operation gestalt, the terminal 10 is moving in the direction of cel 30b of base station 20b in the condition of having existed in cel 30a of base station 20a, and having received service from base station 20a.

[0052] Here, in the terminal 10, the receiving signal strength from base station 20a is measured

periodically, and the measured relative variation for every measuring time of receiving signal strength and receiving signal strength is notified to base station 20a.

[0053] Moreover, in the relative variation of receiving signal strength and receiving signal strength, it is notified also to base station 20b in cel 30b which adjoins cel 30of base station 20a a from base station 20a through the network (un-illustrating).

[0054] Moreover, while the relative variation of the receiving signal strength notified from the terminal 10 and receiving signal strength is stored in base stations 20a and 20b The queue to which priority was given based on the relative variation of receiving signal strength is created beforehand. When the demand of a hand off is sent out from a terminal 10, while being distributed to the queue to which a terminal 10 corresponds based on the relative variation of the receiving signal strength of a terminal 10, based on the receiving signal strength of a terminal 10, waiting ranking is determined in the queue to which the terminal 10 was distributed. Then, hand off control is performed based on priority.

[0055] Below, the calculation approach of the relative variation of receiving signal strength and the decision approach of priority in this gestalt are explained.

[0056] It is drawing explaining the case where drawing 2 is drawing for explaining the calculation approach of the receiving signal strength in the hand off control system shown in drawing 1, and drawing explaining the case where drawing 2 (a) moves from the location which has the receiving signal strength with two same terminals, and drawing 2 (b) move to the location where receiving signal strength becomes a hand off threshold from the location which has the receiving signal strength from which two terminals differ mutually. In addition, in drawing 2, time amount is shown in an axis of abscissa, and receiving signal strength is shown in the axis of ordinate, respectively.

[0057] In drawing 2 (a), the terminal whose receiving signal strength in time of day t0 was P0 moves, and suppose that receiving signal strength was set to PL1 in time of day t1. The relative variation in that case is defined by  $(PL1-P0)/(PL1+P0)$ .

[0058] Moreover, the terminal whose receiving signal strength in time of day t0 was P0 moves, and suppose that receiving signal strength was set to PH1 in time of day t1. The relative variation in that case is defined by  $(PH1-P0)/(PH1+P0)$ .

[0059] The absolute variation of the received electric-field signal strength of the terminal with which receiving signal strength was set to PL1 in time of day t1 serves as  $\Delta PL1$  here. The received electric-field signal strength of the terminal with which receiving signal strength was set to PH1 in time of day t1 absolutely moreover, variation It is set to absolutely bigger  $\Delta PH1$  of the received electric-field signal strength of the terminal with which receiving signal strength was set to PL1 in time of day t1 than  $\Delta PL1$  of variation. How depending on which the terminal with which receiving signal strength was set to PH1 in time of day t1 keeps away from a base station rather than the terminal with which receiving signal strength was set to PL1 in time of day t1 will be quick.

[0060] In addition, the terminal whose receiving signal strength in time of day t0 was P0 moves the relative variation mentioned above. When receiving signal strength is set to PL1 in time of day t1,  $(PL1-P0)/PL1$ , Or it can also define by  $(PL1-P0)/P0$ , and the terminal whose receiving signal strength in time of day t0 was P0 moves, and suppose that receiving signal strength was set to PH1 in time of day t1.  $(PH1-P0)/PH1$  or  $(PH1-P0)/P0$  can also define the relative variation in that case.

[0061] Moreover, in drawing 2 (b), the terminal whose receiving signal strength in time of day t0 was PL2 moves, and suppose that receiving signal strength became the hand off threshold P1 in time of day t1. The relative variation in that case is defined by  $(P1-PL2)/(t1-t0)$ .

[0062] Moreover, the terminal whose receiving signal strength in time of day t0 was PH2 moves, and suppose that receiving signal strength became the hand off threshold P1 in time of day t1. The relative variation in that case is defined by  $(P1-PH2)/(t1-t0)$ .

[0063] In time of day t0, the absolute variation of the received electric-field signal strength of the terminal whose receiving signal strength was PL2 serves as  $\Delta PL2$  here. In time of day t0, the received electric-field signal strength of the terminal whose receiving signal strength was PH2 absolutely moreover, variation In time of day t0, receiving signal strength serves as absolutely bigger  $\Delta PH2$  of the received electric-field signal strength of the terminal which was PL2 than  $\Delta PL2$  of

variation. In time of day t0, how depending on which the terminal whose receiving signal strength was PH2 keeps away from a base station rather than the terminal whose receiving signal strength was PL2 in time of day t0 will be quick.

[0064] Drawing 3 is drawing for explaining the decision approach of the priority hand off processing of the terminal in the hand off control system shown in drawing 1.

[0065] As shown in drawing 3, the priority of the terminal in this gestalt is determined based on the magnitude of the relative variation of the receiving signal strength of the terminal. The relative variation of receiving signal strength is divided into four classes by the magnitude, and the priority of a terminal is determined by into which class the relative variation of the receiving signal strength of each terminal goes.

[0066] For example, terminal 10a goes into a class 2, terminal 10b goes into a class 3, and Terminal c goes into a class 4.

[0067] The class 4 of priority is the highest and the class 1 is the lowest.

[0068] Below, the detailed configuration of the terminal in this gestalt and a base station is explained.

[0069] Drawing 4 is the block diagram showing the example of 1 configuration of the terminal 10 in the hand off control system shown in drawing 1.

[0070] The antenna section 11 for the terminal 10 in this gestalt to perform reception and transmission of an electric wave, as shown in drawing 4, The transceiver amplifier 12 which carries out demultiplexing of a receiving RF signal and the transmitting RF signal while amplifying the transmitting RF signal transmitted through the receiving RF signal and the antenna section 11 which were received through the antenna section 11, While carrying out the quasi-synchronous detection of the receiving RF signal amplified by the transceiver amplifier 12 and changing into a digital signal The wireless section 13 which changes into an analog signal the sending signal transmitted through the antenna section 11, and is changed into a transmitting RF signal by quadrature modulation, Error-correcting-code-izing of the sending signal transmitted through the recovery of an input signal, the synchronization, the formation of an error correction double sign, and demultiplexing and the antenna section 11 of data changed into the digital signal in the wireless section 13, While performing baseband signaling processing of frame-izing, a data modulation, etc. The baseband signaling processing section 14 which possesses a measurement means to measure periodically the reinforcement of the input signal from base station 20a, and measures the reinforcement of this input signal, The relative variation calculation section 15 which is a calculation means to compute the relative variation for every measuring time of the reinforcement of the input signal measured in the baseband processing section 14, The terminal-interface section 16 which performs an interface with the hand set and external data terminal (un-illustrating) which have Voice CODEC and the adapter ability for data, and were connected outside. It has the radio control function which transmits and receives a control signal, and consists of control sections 17 which control actuation of the transceiver amplifier 12, the wireless section 13, the baseband signaling processing section 14, the relative variation calculation section 15, and the terminal-interface section 16.

[0071] In the terminal 10 constituted as mentioned above, when a signal is transmitted to base station 20a, first, baseband signaling processing is carried out in the baseband signaling processing section 14, and the signal inputted through the terminal-interface section 16 is changed into an analog signal in the wireless section 13 after that.

[0072] Next, in the transceiver amplifier 12, the signal changed into the analog signal in the wireless section 13 is amplified, and the amplified signal is transmitted to base station 20a through the antenna section 11.

[0073] On the other hand, when the signal transmitted from base station 20a is received, the signal received through the antenna section 11 is first amplified in the transceiver amplifier 12. In the wireless section 13, the quasi-synchronous detection of the amplified signal is carried out, and it is changed into a digital signal, and after that, in the baseband signaling processing section 14, baseband processing is carried out and the signal changed into the digital signal in the wireless section is outputted through the terminal-interface section 16.

[0074] Moreover, in the baseband signaling processing section 14, the reinforcement of the input signal from base station 20a is measured periodically, and the relative variation for every measuring time of the reinforcement of the input signal measured in the baseband processing section 14 is computed in the relative change calculation section 15.

[0075] The relative variation of the reinforcement of the input signal measured in the baseband signaling processing section 14 and the reinforcement of the input signal computed in the relative change calculation section 15 is notified to coincidence for every predetermined period at base station 20a.

[0076] Drawing 5 is the block diagram showing the example of 1 configuration of the base stations 20a and 20b in the hand off control system shown in drawing 1.

[0077] The antenna section 21 for the base stations 20a and 20b in this gestalt to perform reception and transmission of an electric wave, as shown in drawing 5. The transceiver amplifier 22 which carries out demultiplexing of a receiving RF signal and the transmitting RF signal while amplifying the transmitting RF signal transmitted through the receiving RF signal and the antenna section 21 which were received through the antenna section 21. While carrying out the quasi-synchronous detection of the receiving RF signal amplified by the transceiver amplifier 22 and changing into a digital signal The wireless section 23 which changes into an analog signal the signal transmitted through the antenna section 21, and is changed into a transmitting RF signal by the modulation, Error-correcting-code-izing of the sending signal transmitted through the recovery of an input signal, the synchronization, the formation of an error correction double sign, and demultiplexing and the antenna section 21 of data changed into the digital signal in the wireless section 23. The baseband signaling processing section 24 which performs baseband signaling processing of frame-izing, a data modulation, etc., The relative variation table 25 which is the 1st storing means for storing the relative variation of the receiving signal strength notified from the terminal 10 among the signals processed in the baseband processing section 24. The receiving signal strength table 33 which is the 2nd storing means for storing the receiving signal strength notified from the terminal 10 among the signals processed in the baseband processing section 24. The cable-transmission way interface section 26 which performs an interface with the high order equipment 50 connected outside. The queue section 31 in which the queue 31-1 to which priority was given based on the relative variation of receiving signal strength - 31-n were stored. The hand off demand processing section 28 which distributes the call of an applicable terminal to the queue 31-1 in the queue section 31 - 31-n based on the relative variation of the receiving signal strength of the applicable terminal stored in the relative variation table 25 when a hand off is required from a terminal. The switch 29 for changing processing of the queue 31-1 in the queue section 31 - 31-n based on the decision in the hand off demand processing section 28. The waiting ranking decision section 34 which determines the waiting ranking of the call in each of a queue 31-1 - 31-n based on the receiving signal strength of the applicable terminal stored in the receiving signal strength table 33. When the relative variation stored in the relative variation table 25 is updated The hand off request call memorized by each queue 31-1 - 31-n so that it may be in the condition of being stored in the queue according to the relative variation of the receiving signal strength for every terminal in which it is stored by the relative variation table 25 While supervising [ the queue relocation section 35 rearranged periodically and ] whether it is vacant in a cel and there is any channel When there is an empty channel, it supervises whether the call of a hand off demand exists in a queue 31-1 - 31-n. The queue control section 32 which is vacant based on the priority of a queue 31-1 - 31-n, and the waiting ranking of the call in each of a queue 31-1 - 31-n, and assigns the call of this hand off demand to a channel when there is a call of a hand off demand. While controlling actuation of the transceiver amplifier 22, the wireless section 23, the baseband signaling processing section 24, the cable-transmission way interface section 26, and the queue control section 32 A control signal with high order equipment 50 is transmitted and received, and it consists of control sections 27 which perform wireless line control, setting release of a wireless circuit, etc. In addition, the priority of the queue 31-1 in the queue section 31 - 31-n has the highest priority of a queue 31-1, and is the lowest. [ of the priority of queue 31-n ] Moreover, the waiting ranking of the call in each of a queue 31-1 - 31-n is controlled to stand in a line sequentially from what has the weak receiving signal strength in a terminal. Moreover, the receiving signal strength stored in the receiving signal strength table 33 is

updated whenever receiving signal strength is notified from a terminal 10, and the waiting ranking decision section 34 determines the waiting ranking of the call in each of a queue 31-1 - 31-n whenever the receiving signal strength stored in the receiving signal strength table 33 is updated.

[0078] Below, the actuation in the hand off control system constituted as mentioned above is explained.

[0079] Drawing showing processing actuation [ in / in drawing 6 (a) / the hand off demand processing section 28 ], drawing showing processing actuation [ in / in drawing 6 (b) / the waiting ranking decision section 34 ], drawing showing processing actuation [ in / in drawing 7 / the queue relocation section 35 ], and drawing 8 are drawings showing the processing actuation in the queue control section 32.

[0080] First, the processing actuation in the hand off demand processing section 28 is explained with reference to drawing 6 (a).

[0081] In the terminal 10, the receiving signal strength from base station 20a is measured periodically, and the relative variation for every measuring time of the measured receiving signal strength and receiving signal strength is notified to base station 20a.

[0082] The receiving signal strength which the receiving signal strength of the terminal 10 notified to base station 20a was stored in the receiving signal strength table 33 in base station 20a, and the relative variation of receiving signal strength was stored in the relative variation table 25 in base station 20a, respectively, and was stored in the receiving signal strength table 33 is updated whenever it is notified from a terminal 10.

[0083] Here, in the relative variation of the receiving signal strength of a terminal 10, and receiving signal strength, it is notified also to base station 20b from base station 20a through the cable-transmission way interface section 26 and a network, and the receiving signal strength of a terminal 10 is stored in the receiving signal strength table 33 in base station 20b, and the relative variation of the receiving signal strength of a terminal 10 is stored also in the relative variation table 25 in base station 20b, respectively.

[0084] Moreover, the relative variation of the receiving signal strength of a terminal is divided into two or more classes according to the value, the queue 31-1 by which priority was given to each - 31-n are created beforehand, and it is stored in the queue section 31. In addition, in a queue 31-1 - 31-n, a class with the biggest relative variation of receiving signal strength serves as a queue 31-1, priority becomes high most, a class with the smallest relative variation of receiving signal strength is set to queue 31-n, and priority becomes low most.

[0085] Here, if the terminal 10 keeps away from base station 20a, the receiving signal strength from base station 20a in a terminal 10 becomes weak gradually. In the terminal 10, the receiving signal strength from base station 20a is measured periodically, and if the measured receiving signal strength becomes below the hand off threshold decided beforehand, a hand off demand will be sent out from a terminal 10 to base station 20a. In addition, in the hand off demand sent out from the terminal 10 to base station 20a, it is notified to base station 20b from base station 20a through the cable-transmission way interface section 26 and a network.

[0086] When hand off processing is required from base station 20a from a terminal 10, the hand off demand is sent out to base station 20b (step S1), and the relative variation of the receiving signal strength of the terminal 10 which required hand off processing is first extracted from the relative variation table 25 in the hand off demand processing section 28 in base station 20b (step S2).

[0087] Next, in the hand off demand processing section 28, the call of the hand off demand by the terminal 10 is distributed to the queue of the class corresponding to the relative variation of the receiving signal strength extracted at step S2 among the queues within a queue 31 (step S3). Next, processing actuation of the waiting ranking decision section 34 is explained with reference to drawing 6 (b).

[0088] In the waiting ranking decision section 34, the receiving signal strength of the terminal 10 which required hand off processing is extracted from the receiving signal strength table 33 (step S4).

[0089] Then, based on the receiving signal strength extracted in step S4, the waiting ranking of the call of a terminal 10 is determined by control of the waiting ranking decision section 34 in the queue to which the call of the hand off demand by the terminal 10 was distributed (step S5). In addition, the waiting ranking of the call in each of a queue 31-1 - 31-n is updated whenever the receiving signal

strength stored in the receiving signal strength table 33 is updated.

[0090] Moreover, in the queue relocation section 35, as shown in drawing 7, the relative variation of the hand off request call stored in each queue 31-1 - 31-n is periodically extracted from the relative variation table 25 (step S6). And the queue relocation section 35 will rearrange the hand off request call to other queues corresponding to the class, if the hand off request call memorized by a certain queue stops belonging to the class corresponding to the queue by updating relative variation (step S7). It is checked whether on the other hand, in the queue control section 32, first, it is vacant in cel 30b, and there is any channel (step S11).

[0091] When it is checked that it is vacant in step S11, and there is a channel, it is checked whether the call of a hand off demand exists in the queue 31-1 in the queue section 31 - 31-n (step S12).

[0092] When it is checked that the call of a hand off demand exists in the queue 31-1 in the queue section 31 - 31-n in step S12, the call of the hand off demand which exists in a queue 31-1 - 31-n is assigned to the empty channel in cel 30b in the sequence based on priority and the waiting ranking in a queue 31-1 - 31-n (step S13).

[0093] It sets to the priority of a queue 31-1 - 31-n here. The priority of a queue 31-1 is the highest. Since the priority of queue 31-n is the lowest, The call of the hand off demand within a queue 31-1 is processed most previously, and is sequentially processed after that like the call of the hand off demand in the call of the hand off demand within a queue 31-2, the call of the hand off demand within a queue 31-3, ..., queue 31-n. Moreover, when two or more calls exist in the same queue, it is processed in the sequence based on the waiting ranking determined in the waiting ranking decision section 34. Moreover, when two or more calls which have the waiting ranking same in the same queue exist, it is processed in the sequence distributed to the queue.

[0094] Moreover, processing of the call which remains in the queue control section 32 in the condition that the relative variation of receiving signal strength and receiving signal strength will not be notified from a terminal 10 when the call of the hand off demand by this terminal 10 remains in a queue 31-1 - 31-n is not performed, but it is discarded from a queue and hand off processing of a call in which the following waiting ranking was given is performed.

[0095] Moreover, when a terminal 10 is not able to perform a hand off in hand off area, in the queue control section 32, processing of the call of the hand off demand by this terminal 10 is not performed, but hand off processing of a call in which the following waiting ranking was given is performed.

[0096] In addition, the usual processing is performed when a new call occurs.

[0097] Moreover, although the relative variation of the receiving signal strength in a terminal 10 was computed in the relative variation calculation section 15 within a terminal 10 and was notified to base stations 20a and 20b with the receiving signal strength in a terminal 10 in this operation gestalt In the exchange which becomes high order equipment 50 of base stations 20a and 20b or base stations 20a and 20b From the receiving signal strength notified from the terminal 10, a means to compute the relative variation for every measuring time of the receiving signal strength in a terminal 10 is established. From a terminal 10, only receiving signal strength is notified to base stations 20a and 20b, and computing the relative variation for every measuring time of the receiving signal strength in a terminal 10 at a base station or the exchange is also considered.

[0098] Although this operation gestalt explained that hand off processing was performed in the sequence based on the passing speed of a terminal, since priority is determined based on the relative variation of the receiving signal strength of the terminal, in this invention, hand off processing is able to be performed in consideration of the moving trucking of a terminal in the sequence based on the speed of how to keep away from a base station.

[0099] Drawing 9 is drawing for explaining control by the moving trucking of a terminal in the hand off control system of this operation gestalt.

[0100] as shown in drawing 9, terminal 10a shall move the cel 30 of a base station 20 linearly, and terminal 10b shall move between predetermined and in the inside of a cel 20 so that distance with a base station 20 may serve as about 1 law In addition, let mutually passing speed of terminal 10a and terminal 10b be an equal.



[0101] Then, although the receiving signal strength of terminal 10a changes, the receiving signal strength of terminal 10b becomes almost fixed between predetermined.

[0102] Therefore, when hand off processing is required in Terminals 10a and 10b, rather than the call of a hand off demand according [ the direction of the call of the hand off demand by terminal 10a with the big relative variation of receiving signal strength ] to terminal 10b, priority becomes high and comes to be processed previously.

[0103] (2nd operation gestalt) Next, the hand off control system of the 2nd operation gestalt of this invention is explained. With the operation gestalt of the above 1st, if the relative variation of the receiving signal strength stored in the relative variation table 25 is updated, the queue relocation section 35 will rearrange the hand off request call in a queue 31-1 - 31-n to the queue corresponding to the updated relative variation. And if the receiving signal strength stored in the receiving signal strength table 33 is updated, renewal of the waiting ranking in a queue 31-1 - 31-n will be performed by the waiting ranking decision section 34.

[0104] However, when relative variation is changed in the threshold level neighborhood which performs a class division of a queue, relocation by the queue relocation section 35 will be performed frequently, and the processing burden in a control section 27 becomes large.

[0105] For example, as relative variation shows drawing 10, when it changes, in time of day t1, t2, t3, t4, and t5, relocation by the queue relocation section 35 is performed.

[0106] Moreover, when receiving signal strength is changed similarly in the neighborhood of the threshold level to which renewal of the waiting ranking within a queue is performed, an update process of the waiting ranking by the waiting ranking decision section 34 will be performed complicated, and the processing burden in a control section 27 becomes large.

[0107] The hand off control system of this operation gestalt is for reducing the processing burdens in the case of being above, and the processing actuation at the time of updating in the waiting ranking decision section 34 and the queue relocation section 35 differs as compared with the operation gestalt of the above 1st. And the other processing actuation, a configuration, etc. are the same as that of the operation gestalt of the above 1st.

[0108] Next, the actuation in the hand off control system of this operation gestalt is explained with reference to drawing 11 and drawing 12.

[0109] The flow chart and drawing 12 which show processing actuation of the waiting ranking decision section [ in / in drawing 11 / the hand off control system of this operation gestalt ] 34 are a flow chart which shows processing actuation of the queue relocation section 35 in the hand off control system of this operation gestalt.

[0110] First, processing actuation of the waiting ranking decision section 34 is explained using drawing 11.

[0111] In the waiting ranking decision section 34, the receiving signal strength of the terminal 10 which required hand off processing is extracted from the receiving signal strength table 33 (step S21).

[0112] And the receiving signal strength extracted from the receiving signal strength table 33 the waiting ranking decision section 34 [ whether it is larger than the value adding the hysteresis value (H1) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call, and ] Or it judges whether it is smaller than the value which subtracted the hysteresis value (H1) defined beforehand from the minimum threshold of the current waiting ranking of the hand off request call (step S22).

[0113] And only when it corresponds to criteria in processing of S22, in the waiting ranking decision section 34, the waiting ranking of the call of a terminal 10 is determined based on the receiving signal strength extracted at step S21 in the queue to which the call of the hand off demand by the terminal 10 was distributed (step S23).

[0114] Here, the upper limit threshold in processing of step S30 is a value of the receiving signal strength of the hand off request call with which waiting ranking is the value of the receiving signal strength of the hand off request call set up previously [ one ], and waiting ranking is set up after one rather than the hand off request call with which the minimum threshold is processing from the hand off

request call which is processing.

[0115] Next, processing actuation of the queue relocation section 35 is explained using drawing 12.

[0116] In the queue relocation section 35, the relative variation of the hand off request call stored in each queue 31-1 - 31-n is periodically extracted from the relative variation table 25 (step S6).

[0117] And the relative variation extracted from the relative variation table 25 the queue relocation section 35 [ whether it is larger than the value adding the hysteresis value (H2) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call is carried out, and ] Or it judges whether it is smaller than the value which subtracted the hysteresis value (H2) defined beforehand from the minimum threshold of the class of the queue by which current arrangement of the hand off request call is carried out (step S30).

[0118] And only when it corresponds to criteria in processing of step S30, the queue relocation section 35 will rearrange the hand off request call to other queues corresponding to the class, if the hand off request call memorized by a certain queue stops belonging to the class corresponding to the queue by updating relative variation (step S7).

[0119] Here, when the hand off request call corresponds to the class 2 in drawing 3, the upper limit threshold in processing of step S22 is the level of the boundary of a class 2 and a class 3, and a minimum threshold is the level of the boundary of a class 1 and a class 2.

[0120] For example, as relative variation shows drawing 13, when it changes, in time of day t6, relocation by the queue relocation section 35 is performed only once. This shows that the count of an update process is becoming fewer as compared with the count of the relocation in drawing 10 having been performed 5 times.

[0121] With this operation gestalt, a hysteresis characteristic can be given to the judgment at the time of performing decision processing of the waiting ranking by the waiting ranking decision section 34, and relocation processing of the queue by the queue relocation section 35, and control throughput can be reduced by reducing the count of an update process.

[0122] Although the case where a hysteresis characteristic was given to both judgments at the time of performing decision processing of the waiting ranking by the waiting ranking decision section 34 and relocation processing of the queue by the queue relocation section 35 was explained, this invention is not limited to this and you may make it give a hysteresis characteristic to the judgment in one of processings with this operation gestalt furthermore.

[0123] Moreover, although not shown in drawing, the hand off control system of the above 1st and the 2nd operation gestalt is equipped with the record medium which recorded the program for performing the hand off control approach. This record medium may be a record medium of CD-ROM, a floppy disk, a magneto-optic disk, semiconductor memory, or others.

[0124] This program is read into the base station and terminal of a hand off control system from a record medium, and controls actuation of a base station and a terminal. And this base station and terminal perform the above-mentioned processing by this program control.

[Translation done.]

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## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the hand off control system of the 1st operation gestalt of this invention.

[Drawing 2] It is drawing explaining the case where are drawing for explaining the calculation approach of the receiving signal strength in the hand off control system shown in drawing 1, and drawing explaining the case where drawing 2 (a) moves from the location which has the receiving signal strength with two same terminals, and drawing 2 (b) move to the location where receiving signal strength becomes a hand off threshold from the location which has the receiving signal strength from which two terminals differ mutually.

[Drawing 3] It is drawing for explaining the decision approach of the priority hand off processing of the terminal in the hand off control system shown in drawing 1.

[Drawing 4] It is the block diagram showing the example of 1 configuration of the terminal in the hand off control system shown in drawing 1.

[Drawing 5] It is the block diagram showing the example of 1 configuration of the base station in the hand off control system shown in drawing 1.

[Drawing 6] It is drawing ( drawing 6 (b)) showing the processing actuation in drawing ( drawing 6 (a)) and the waiting ranking decision section 34 which show the processing actuation in the hand off demand processing section 28.

[Drawing 7] It is drawing showing the processing actuation in the queue relocation section 35.

[Drawing 8] It is drawing showing the processing actuation in the queue control section 32.

[Drawing 9] It is drawing for explaining control by the moving trucking of a terminal in a showing-in drawing 1 hand off control system.

[Drawing 10] It is drawing showing change of the relative variation of the hand off control system of the 1st operation gestalt of this invention, and the relation of the queue relocation section 35 of operation.

[Drawing 11] It is drawing showing the processing actuation in the waiting ranking decision section 34 of the hand off control system of the 2nd operation gestalt of this invention.

[Drawing 12] It is drawing showing the processing actuation in the queue relocation section 35 of the hand off control system of the 2nd operation gestalt of this invention.

[Drawing 13] It is drawing showing change of the relative variation of the hand off control system of the 2nd operation gestalt of this invention, and the relation of the queue relocation section 35 of operation.

[Drawing 14] It is drawing explaining the hand off control system in common migration communication system, and drawing in which drawing 14 (a) shows the case where a cel radius is set as arbitration, and drawing 14 (b) are drawings showing the case where a cel radius is reduced rather than what was shown in drawing 14 (a).

[Description of Notations]

10, 10a-10n Terminal

11 21 Antenna section

12 22 Transceiver amplifier

13 23 Wireless section  
14 24 Baseband signaling processing section  
15 Relative Variation Calculation Section  
16 Terminal-Interface Section  
17 27 Control section  
20, 20a, 20b Base station  
25 Relative Variation Table  
26 Cable-Transmission Way Interface Section  
28 Hand Off Demand Processing Section  
29 Switch  
30, 30a, 30b Cel  
31 Queue Section  
31-1 - 31-n Queue  
32 Queue Control Section  
33 Receiving Signal Strength Table  
34 Waiting Ranking Decision Section  
35 Queue Relocation Section  
40 Area  
50 High Order Equipment

[Translation done.]

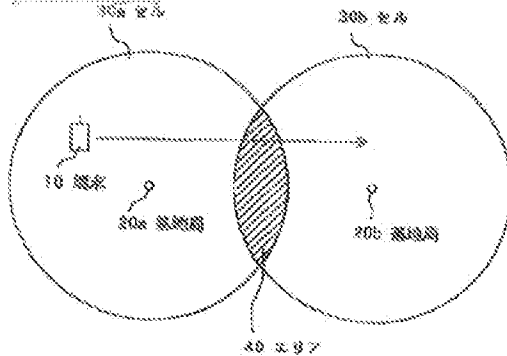
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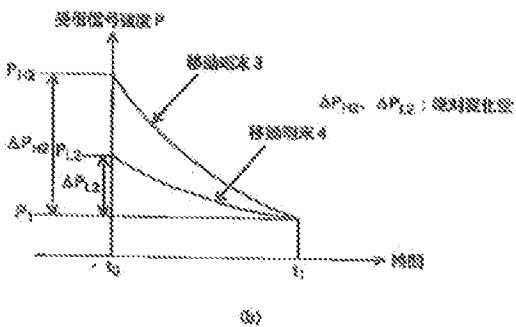
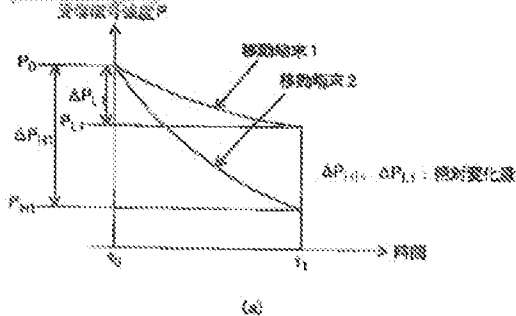
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## DRAWINGS

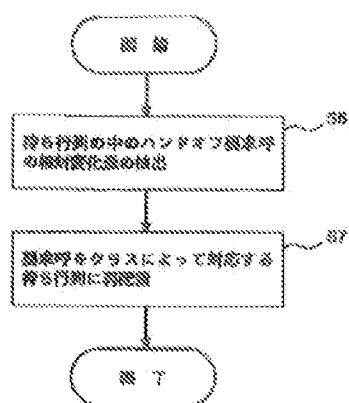
[Drawing 1]



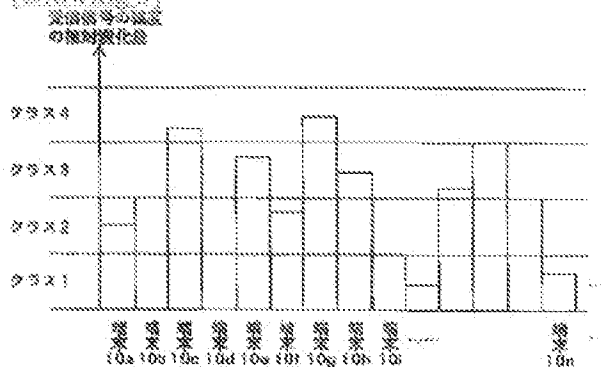
[Drawing 2]



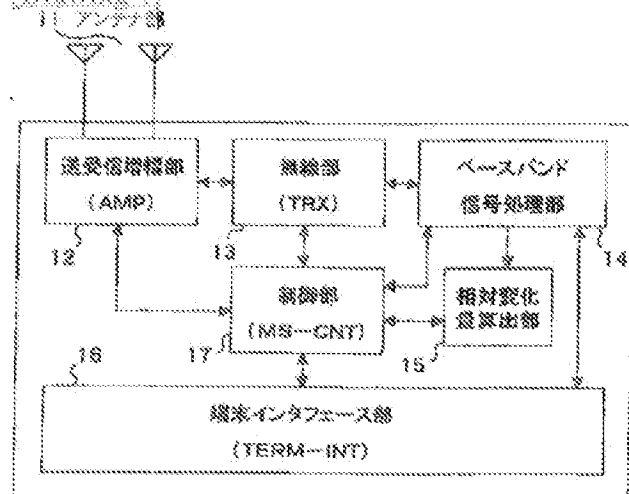
[Drawing 7]



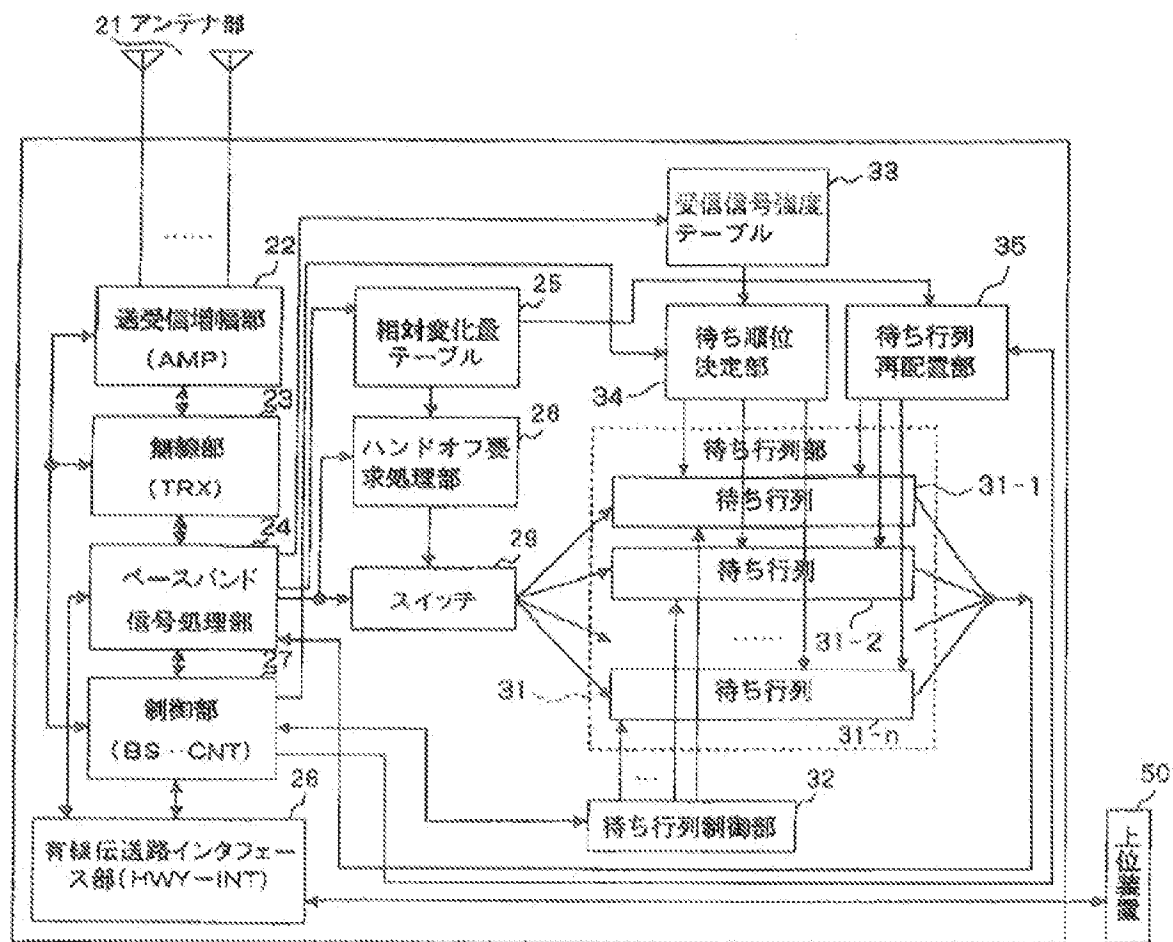
[Drawing 3]



[Drawing 4]

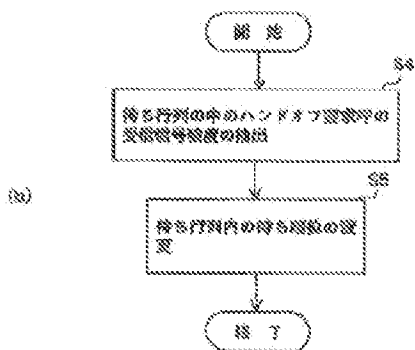
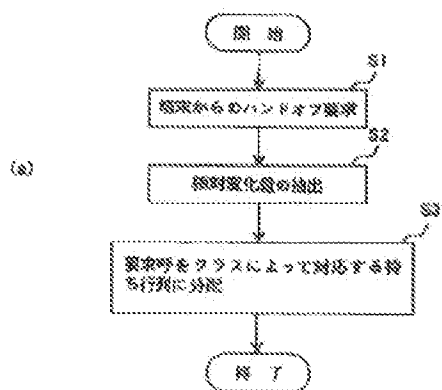


[Drawing 5]

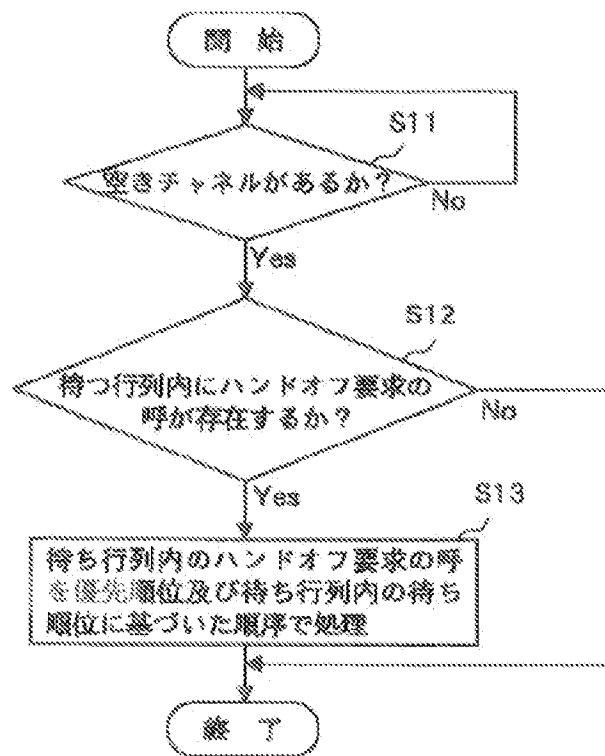


[Drawing 6]

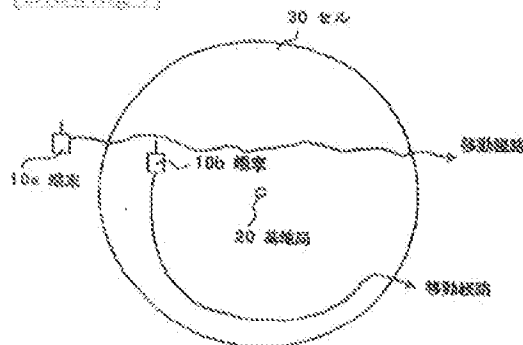




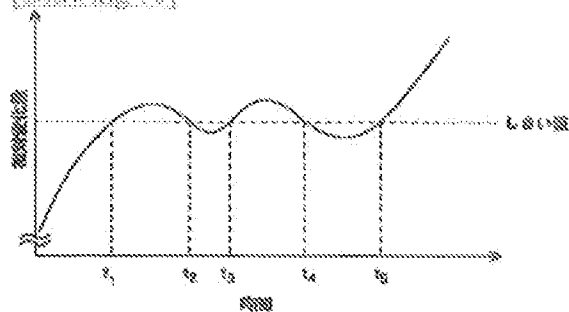
[Drawing 8]



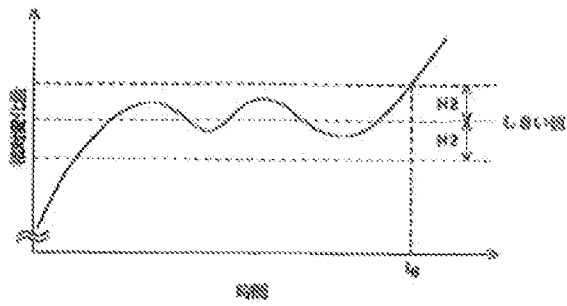
[Drawing 9]



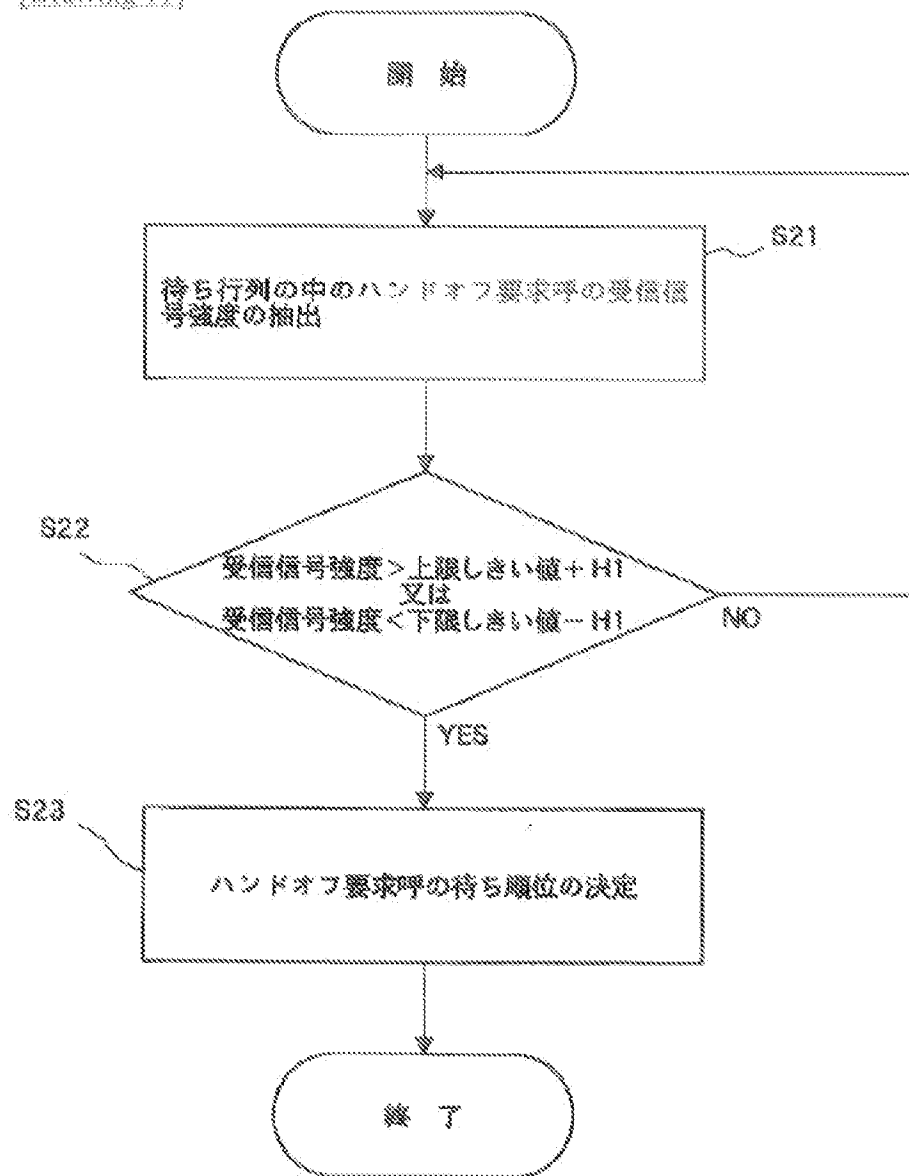
[Drawing 10]



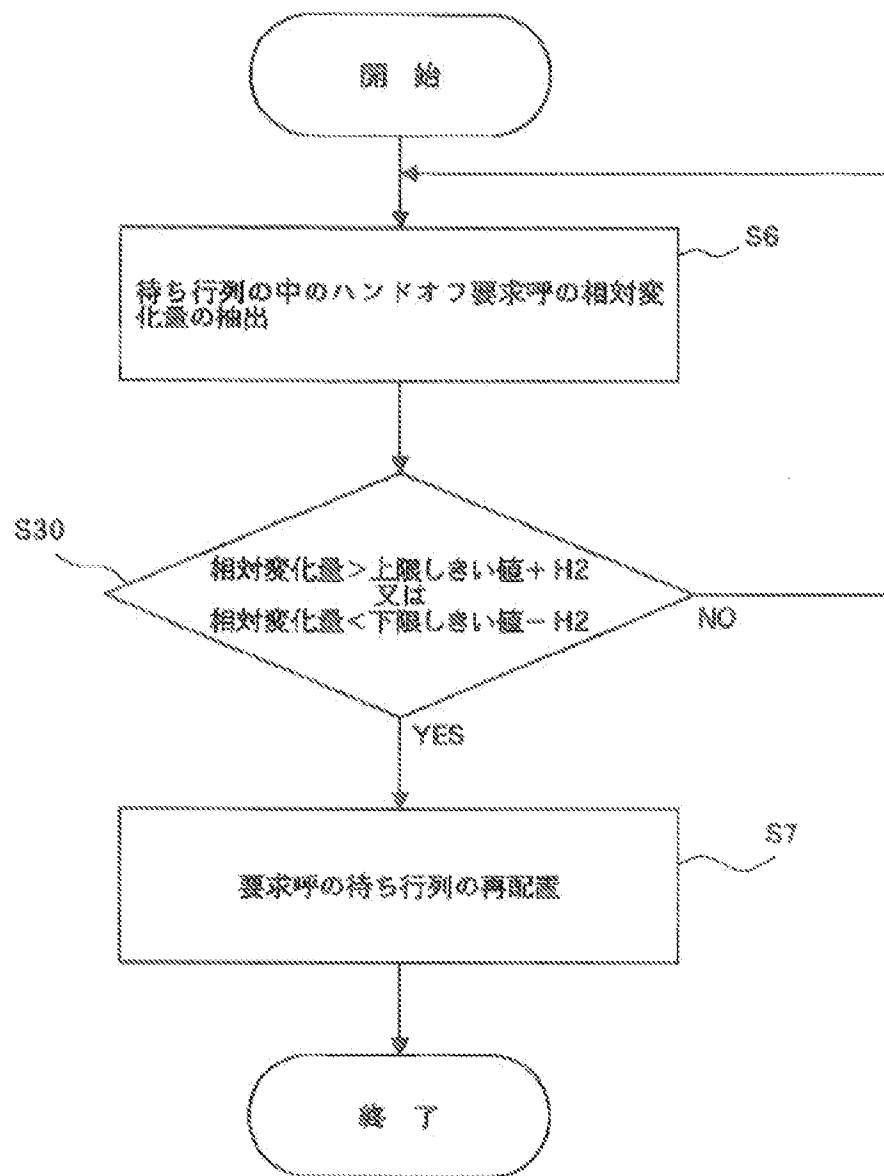
[Drawing 13]



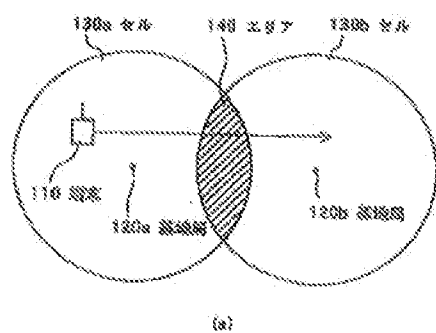
[Drawing 11]



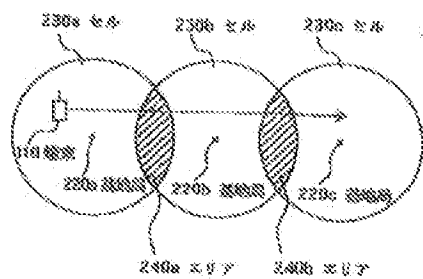
[Drawing 12]



[Drawing 14]



(a)



(b)

[Translation done.]

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## WRITTEN AMENDMENT

----- [a procedure revision]

[Filing Date] March 4, Heisei 11 (1999. 3.4)

[Procedure amendment 1]

[Document to be Amended] Specification

[Item(s) to be Amended] 0013

[Method of Amendment] Modification

[Proposed Amendment]

[0013] In order to avoid this, the approach a hand off has a queue to the demand from a required terminal For example D.Hong and S.S.Rappaport, "Traffic model and performance analysis for cellular mobile radio telephone systems with prioritized and nonprioritized handoff procedures", IEEE Trans.Veh.Technol., vol.VT-35, and 1986., Q.A.Zeng and K.Mukumoto, A.Fukuda and "Performance analysis of mobile cellular It is indicated in radio system with priority reservation handoff procedures", IEEE Proc.VTC-94, vol.3, and 1994.

----- [a procedure revision]

[Filing Date] July 1, Heisei 11 (1999. 7.1)

[Procedure amendment 1]

[Document to be Amended] Specification

[Item(s) to be Amended] Claim

[Method of Amendment] Modification

[Proposed Amendment]

[Claim(s)]

[Claim 1] In case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, it is the hand off control system which performs hand off processing of this terminal.

Said terminal,

A measurement means to measure periodically the reinforcement of the input signal from said base station,

A calculation means to compute the relative variation for every measuring time of the reinforcement of the input signal measured with this measurement means,

It has a transmitting means to transmit the measurement result in said measurement means, and the calculation result in said calculation means to said base station,

Said base station,

An interface means to notify this hand off demand to the base station in the adjoining cel when a hand off is required from said terminal while notifying the relative variation of the reinforcement of the input signal transmitted from said terminal, and the reinforcement of an input signal to the base station in the adjoining cel,

A queue storing means notified through this interface means by which the queue to which priority was given based on the relative variation of the reinforcement of an input signal is stored,

A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off demand is notified through said interface means,

A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means,

A queue relocation means to rearrange periodically the call stored in said each queue for every measuring time of said receiving signal strength so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength when said relative variation is updated,

The hand off control system characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel when it supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel, and is vacant in this cel and there is a channel.

[Claim 2] In case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels, it is the hand off control system which performs hand off processing of this terminal,

Said terminal,

A measurement means to measure periodically the reinforcement of the input signal from said base station,

It has a transmitting means to transmit the measurement result in this measurement means to said base station,

Said base station,

An interface means to notify this hand off demand to the base station in the adjoining cel when a hand off is required from said terminal while notifying the reinforcement of the input signal transmitted from said terminal to the base station in the adjoining cel,

A calculation means notified through this interface means to compute the relative variation for every measuring time of the reinforcement of an input signal,

A queue storing means by which the queue to which priority was given based on the calculation result in this calculation means is stored,

A demand processing means to distribute to the queue which corresponds the call of this terminal based on the relative variation of the reinforcement of the input signal in the terminal which required the hand off when a hand off demand is notified through said interface means,

A waiting ranking decision means to determine the waiting ranking of the call of said terminal within the queue to which the call of said terminal was distributed for every measuring time of the reinforcement of said input signal based on the reinforcement of the input signal measured with said measurement means,

A queue relocation means to rearrange periodically the call stored in said each queue for every measuring time of said receiving signal strength so that it may be in the condition of being stored in the queue according to the relative variation of receiving signal strength when said relative variation is updated,

The hand off control system characterized by having the queue control means which assigns the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel when it supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel, and is vacant in this cel and there is a channel.

[Claim 3] In a hand off control system according to claim 1,



Said base station,

It has the 1st storing means for storing the relative variation of the reinforcement of the input signal notified through said interface means,

Said demand processing means is a hand off control system characterized by distributing the call of this terminal to the corresponding queue based on the relative variation of the reinforcement of the input signal of the applicable terminal stored in said 1st storing means when a hand off demand is notified through said interface means.

[Claim 4] In a hand off control system given in claim 1 thru/or any 1 term of 3,

Said base station,

It has the 2nd storing means for storing the reinforcement of the input signal notified through said interface means,

The aforementioned waiting ranking decision means is a hand off control system characterized by determining the waiting ranking of the call of this terminal within the queue to which the call of this terminal was distributed based on the reinforcement of the input signal of the applicable terminal stored in said 2nd storing means.

[Claim 5] In a hand off control system given in claim 1 thru/or any 1 term of 4,

Said queue storing means is a hand off control system characterized by setting up the relative variation of the reinforcement of said input signal highly in big forge-fire priority.

[Claim 6] In a hand off control system given in claim 1 thru/or any 1 term of 5,

Said queue storing means is a hand off control system which is divided for every level the relative variation of the reinforcement of said input signal was beforehand decided to be, and is characterized by the thing into which it was divided, and for which said queue is stored for every class.

[Claim 7] In a hand off control system given in claim 1 thru/or any 1 term of 6,

The aforementioned waiting ranking decision means is a hand off control system characterized by determining the waiting ranking of the call of said terminal that the call of said terminal is located in a line sequentially from what has the weak reinforcement of said input signal.

[Claim 8] In a hand off control system given in claim 1 thru/or 7 any 1 terms,

The reinforcement of said input signal is a hand off control system characterized by becoming so weak that said terminal keeping away from said base station.

[Claim 9] When said receiving signal strength of a certain hand off request call is updated, the aforementioned waiting ranking decision means [ whether this receiving signal strength is larger than the value adding the 1st hysteresis value (H1) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call concerned, and ] Or the hand off control system of eight given in any 1 term from claim 1 which updates waiting ranking of the call stored in said each queue only when smaller than the value which subtracted said 1st hysteresis value (H1) from the minimum threshold of the current waiting ranking of the hand off request call concerned.

[Claim 10] When said relative variation of a certain hand off request call is updated, said queue relocation means [ whether it is larger than the value to which this relative variation added the 2nd hysteresis value (H2) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call concerned is carried out, and ] Or only when the hand off request call concerned is smaller than the value which subtracted said 2nd hysteresis value (H2) from the minimum threshold of the class of the queue by which current arrangement is carried out The hand off control system of nine given in any 1 term from claim 1 which rearranges the call stored in said each queue.

[Claim 11] It is the hand off control approach performed in case the terminal which performs communication link actuation through the base station in a cel moves between two or more cels,

The reinforcement of the input signal from said base station in said terminal is measured periodically,

The relative variation for every measuring time of the reinforcement of the measured input signal is computed,

The relative variation of the reinforcement of the input signal of said base station in said terminal is stored beforehand.

When a hand off is required, the call of the terminal which required the hand off is distributed to the queue which corresponds among the queues to which the priority by said relative variation was given beforehand based on the relative variation of the reinforcement of the input signal in the applicable terminal in which it was stored,

Based on the reinforcement of the measured input signal, the waiting ranking of the call of said terminal is determined for every measuring time of the reinforcement of said input signal within the queue to which the call of said terminal was distributed,

When said relative variation is updated, the call stored in said each queue is periodically rearranged for every measuring time of said receiving signal strength so that it may be in the condition of being stored in the queue according to said updated relative variation,

The hand off control approach characterized by assigning the call distributed in this queue in the sequence based on the priority of said queue, and the waiting ranking within this queue to said empty channel when it supervises whether it is vacant in the cel of the migration place of said terminal, and there is any channel, and is vacant in this cel and there is a channel.

[Claim 12] In the hand off control approach according to claim 11,

The reinforcement of the input signal of said base station in said terminal is stored beforehand,

The hand off control approach characterized by determining the waiting ranking of the call of this terminal within the queue to which the call of this terminal was distributed based on the reinforcement of the input signal of the stored applicable terminal.

[Claim 13] In the hand off control approach according to claim 11 or 12,

The hand off control approach characterized by the relative variation of the reinforcement of said input signal setting up big forge-fire priority highly.

[Claim 14] In a hand off control system given in claim 11 thru/or any 1 term of 13,

The hand off control approach which divides for every level which was able to determine the relative variation of the reinforcement of said input signal beforehand, and is characterized by the thing into which it was divided, and for which said queue is created for every class.

[Claim 15] In the hand off control approach given in claim 11 thru/or any 1 term of 14,

The hand off control approach characterized by determining the waiting ranking of the call of said terminal that the call of said terminal is located in a line sequentially from what has the weak reinforcement of said input signal.

[Claim 16] In the hand off control approach given in claim 11 thru/or any 1 term of 15,

When the terminal whose reinforcement of the input signal in time of day t0 was P0 moved the relative variation of the reinforcement of said input signal and the reinforcement of an input signal is set to P1 in time of day t1,

$(P1-P0)/(P1+P0)$

The hand off control approach characterized by what is come out and defined.

[Claim 17] In the hand off control approach given in claim 11 thru/or any 1 term of 15,

When the terminal whose reinforcement of the input signal in time of day t0 was P0 moved the relative variation of the reinforcement of said input signal and the reinforcement of an input signal is set to P1 in time of day t1,

$(P1-P0)/P1$

The hand off control approach characterized by what is come out and defined.

[Claim 18] In the hand off control approach given in claim 11 thru/or any 1 term of 15,

When the terminal whose reinforcement of the input signal in time of day t0 was P0 moved the relative variation of the reinforcement of said input signal and the reinforcement of an input signal is set to P1 in time of day t1,

$(P1-P0)/P0$

The hand off control approach characterized by what is come out and defined.

[Claim 19] In the hand off control approach given in claim 11 thru/or any 1 term of 15,

When the terminal whose reinforcement of the input signal in time of day t0 was P0 moved the relative variation of the reinforcement of said input signal and the reinforcement of an input signal is set to P1 in

time of day  $t1$ ,  
 $(P1-P0)/(t1-t0)$

The hand off control approach characterized by what is come out and defined.

[Claim 20] In case said receiving signal strength of a certain hand off request call is updated and the waiting ranking within said each queue is determined [ whether this receiving signal strength is larger than the value adding the 1st hysteresis value (H1) beforehand set to the upper limit threshold of the current waiting ranking of the hand off request call concerned, and ] Or the hand off control approach of 19 given in any 1 term from claim 11 which updates waiting ranking of the call stored in said each queue only when smaller than the value which subtracted said 1st hysteresis value (H1) from the minimum threshold of the current waiting ranking of the hand off request call concerned.

[Claim 21] In case the call which said relative variation of a certain hand off request call is updated, and is stored in said each queue is rearranged [ whether it is larger than the value to which this relative variation added the 2nd hysteresis value (H2) beforehand set to the upper limit threshold of the class of the queue by which current arrangement of the hand off request call concerned is carried out, and ] Or only when the hand off request call concerned is smaller than the value which subtracted said 2nd hysteresis value (H2) from the minimum threshold of the class of the queue by which current arrangement is carried out The hand off control approach of 20 given in any 1 term from claim 11 which rearranges the call stored in said each queue.

[Claim 22] The storage characterized by recording the program for performing the hand off control approach of a publication on claim 11 thru/or any 1 term of 21.

[Translation done.]